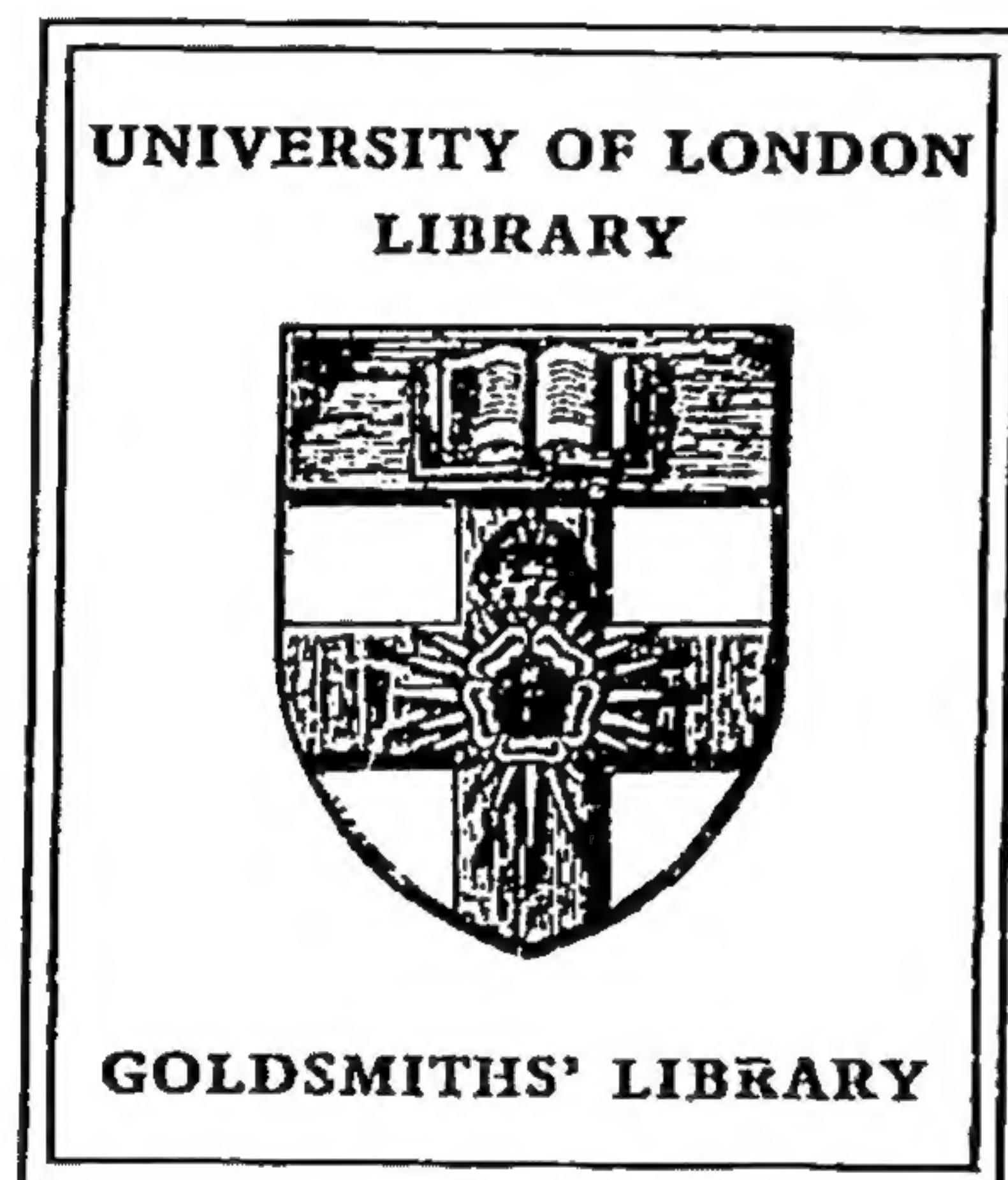


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# CONTINUATION OF THE COMPLETE BODY OF HUSBANDRY.

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The whole Business of the FARMER, and COUNTRY GENTLEMAN,  
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Mr. OSBORNE, the Rev. Mr. TURNER, and others.

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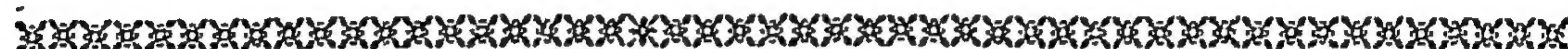
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## C O N T I N U A T I O N

O F T H E

C O M P L E A T B O D Y

O F

H U S B A N D R Y.

## C H A P. I.

*Of English vineyards.*

**T**HE preceding work having been written, as it was undertaken, for the service equally of the farmer and country gentleman, we shall pursue the same plan in the additional part: and shall set out with the consideration of vineyards in England.

The great mistakes which have been made in the choice of ground, and in the management of these peculiar plantations, have in a manner disheartened the kingdom from farther attempts: but there is no reason it should be so. That may succeed very well in a skillful hand, which has failed under the ignorant; and as we shall lay down the true practice in a plain manner, and relate those mistakes which have occasioned the frequent ill success, it will be easy to observe the one, and avoid the other.

This we can say with certainty, that very good wine may be made in England: and that in many parts of the kingdom there are pieces of land which might be turned to some account this way, at a small expence; and others which will answer to a more chargeable preparation, in such a manner as to make the farmer very happy.

We shall not suppose any one will undertake this business, unless he have a piece of ground fit for it; and with this consideration, we may rank the designs and purposes of those who undertake it, under two heads: the country gentleman will probably raise his vines for wine for his own drinking; but the farmer is not to see the plantation in that light. There goes a great deal more trouble to the making the wine, than to the management of the ground; and in this country he may find a purchaser for his product, at any time, or in any condition. I have drank with the distinguished and eminent doctor Shaw, wines made under his own care, from a little vineyard behind his garden at Kensington, which equalled many of the lighter wines of France, and while due care was taken of the vineyard at Hammer-smith, a great deal very good was obtained there for sale: yet neither of these were naturally favourable spots.

The *Bath* vineyards might serve as a better example to the husbandman; who should consider only profit for them, the juice of the grapes was sold there as it was pressed from the fruit, and the owners had no farther care than managing the ground, and gathering.

In one of these instances there was excellent wine made for the table, in the other a profitable kind for sale, and in the third, no more trouble was allowed to this than the farmer usually affords his slightest products, yet they all answered while duly conducted. The two latter might easily have been better managed, and their profits rendered three-fold. We speak of what we know with certainty, having seen and examined them all: and upon this plan we shall direct the culture under two distinct heads, as it will regard the gentleman who raises his vines for the service of his table, and as it may concern the husbandman, who considers the vineyard as part of his crop.

The greatest advantages in both cases will result from introducing the horseshoeing husbandry into this practice, for no growth receives so much benefit from that as the vine; and we can assure the English husbandman, that it is the tillage given to the vineyards abroad; and that their success is more owing to this, than any other article whatsoever.

## C H A P. II.

*Of the proper ground for a vineyard.*

**A** Great inducement to the planting vines in this country, is, that some of our very worst lands will serve the purpose.

The vine thrives best in poor soils, but they must be of a proper condition, and whether pleasure or profit be the intent of the plantation, either will depend in a great degree on that first choice.

In England gardeners always throw rubbish into the ground, where vines are to grow, to impoverish it; and in France, though their land is naturally much poorer, they are often obliged to use the same expedient. It is easy to know the expence there will be in bringing on rubbish to a large ground; and it will be very idle to use such a piece for this purpose, as wants impoverishing: because its natural richness will suit it to crops which requires a better nourishment. Therefore let the choice fall upon a piece of ground which is poor in itself, and the poverty of which is of a right kind; reason says what this should be, and experience confirms it. If the gardener throw in brickbats, because his mould is too rich for the vine, let the husbandman look for a piece of ground which naturally abounds with materials resembling these.

I have observed, that in some parts of England where there are stone quarries, the gardeners use the chippings of stone instead of brickbats, and I have found the grapes always thrive the better. This may be an excellent lesson to the field planter. He sees some mould and some rubbish of this kind affords the proper soil for the vine; and if he can find a piece where there is a quantity of this kind of rubbish naturally in the ground, none can answer his purpose so well.

Of the several kinds of stone, the free-stone and sand-stone are the best, for they are warmest. We have in many parts of England ground which is rendered of little value, by a mixture of such stone in small fragments. I have observed this particularly in Northamptonshire and Leicestershire; and these and the like pieces would be excellent for the purpose of vineyards.

Let the husbandman be careful he make no mistake in the nature of the stone, for that might prevent all success. In Derbyshire the stone toward the surface is often a kind of marble, like that we see sometimes wrought into tables and chimney-pieces. A mixture of this in the ground would be highly improper, for marble is of a cold nature. The chips of free-stone warm a land, for they imbibe and retain the beams of the sun; but it is the contrary in the marble kinds: they always render it cold. Brickbats being of the nature of stone, spongy and porous, are also warm; but I know from experience, that chippings of stone are better. For the service of the gardener these may be bought at the masons, he taking care that no chips of marble are mixed with them; but for the field plantation, they should be naturally in the ground.

In earlier time, this peculiar good quality of stony land for vines was known, and the vineyards planted on such ground were of the greatest service; they produced a good, sound, and strong wine, and that in such quantity as to be the common drink of the better sort of the inhabitants.

Those who had raised vineyards, and made wine from them in such places, were imitated, or thought to be imitated.



tated by others in less favourable soils; and these produced so ill, that they brought the whole practice into disrepute. The monks raised vines in the closes near their monasteries, where the chipings of the stone used in those vast buildings had been thrown, and they always succeeded: so far as we read, there never was one of these plantations that failed. The same success attended those who planted on ground naturally stony: but it was accident which gave the due quality to the soil in the first places, and chance conducted the planter into the second. Forty vineyards were planted in improper, for one on these favourable pieces of ground; and the ill success of the generality, brought the whole into disgrace. Gardening was little understood in our country at that time; and it is not a wonder, that with an unfavouring soil, and poor management, the plantations yielded little.

Thus were vineyards in a manner banished out of England; and it is but of late we have undertaken the raising them again. Many who have made this attempt have been ignorant of the true principles, and therefore have failed: but the husbandman will thus see that it has been practised to advantage, and will learn how it may be so practised again.

The reader sees thus the general requisites, and best advantages for the vine; but these are not the only soils which will suit it. The situation should be warm and open to the sun; and an advantage in this respect will often make amends for some degree of defect in the other.

The great principle is this. The vine requires sun and warmth, and whenever it is planted out of the reach of these, or only so that its roots can go out of their reach of them, it will not succeed.

We have observed, the best soil is a light mould mixed with stony particles, but this is not the only one that is proper; a poor loam, where there is not too much depth of soil, and where the bottom is dry, will answer the purpose; and if occasionally some rubbish of buildings, or of masons yards be brought in, they will greatly improve it.

### CHAP. III.

#### *Of the bottom for a vineyard soil.*

**T**HERE is but one stratum or bottom, which is absolutely improper for a vineyard, but that is too common in England: it is clay. To this, and to the natural depth of the soil in many places, we owe the ill success of former vineyards. These therefore are the two conditions of the ground to be most carefully avoided. The vine requires that its roots should lie dry and warm; and that none of them should run so deep, as to be out of the reach of the sun's influence. It is for this reason, that in the deep mellow soils of England, vines will not succeed; nor when there is a clay at the bottom. In the first of these cases they penetrate so deep, as to be out of the reach of the sun's warmth, and for that reason the juice never properly ripens. In the other they are chilled by the cold wet that always lies upon clay; and therefore either never ripen, or never have a tolerable flavour. These are the two conditions of the ground therefore which the farmer must avoid, who would plant a vineyard for profit, or the gentleman for his table. On the contrary, the best bottoms are a firm dry gravel, or loose stone at due depth, and chalk.

The two first stand recommended by most who have written on the subject; but the third is in many circumstances equal to either. The depth of soil should be greatest over stone, much less will do upon a chalk, and a very little on a gravel; it should not be less than fifteen inches over a bed of stone, less than a foot will do upon the others. Many have feared the stony bottom, but they should be informed, that some of the most flourishing vineyards abroad are upon that bottom, and the very best in England have been so situated.

### CHAP. IV.

#### *Of the situation and exposure.*

**L**ET the planter of a vineyard in England be upon his guard against all inconveniences, or he will injure himself, and continue to discredit the practice; though the contrary of both is as certain, to follow a due choice of ground, and an observance of right rules. A vineyard must not be exposed to the north winds, nor must it ever be planted on a flat piece of ground. The fruit will be blasted in the former of these cases, and chilled till it is good for nothing in the other. Wet always lodges in flats, let the bottom be what it will, and this will certainly destroy the hopes of a vineyard. Some, to avoid this mischief, have taken the steep slope of a hill, but that is as bad: it is

the mistake of ill judging persons, always in avoiding one error, to run into another. The best rule will be to enquire on what ground the vineyards of France and Italy succeed best; and this will be found to be a very gentle declivity, a fall of four feet in fourscore yards, or thereabouts, is as near the matter as can be given in general terms. This, with a proper exposure, will lay the roots open to the sun in their slight bed of mould; and what wet falls more than the necessary quantity for the nourishment of the vines, will drain off.

With regard to the exposure, there is but one kind proper for a vineyard, and this is the south east. If the planter have a piece of ground in this situation, and with these advantages, let him examine the adjacent country with respect to its wood and water, and if it be favourable in these two respects, he may promise himself the greatest success.

It will be seen by these and the succeeding directions, that there are a great many particulars necessary to concur for the making a vineyard prosperous in England; and with all we have said of the practicability of the scheme, we do not pretend it will do without them. This will shew there is no wonder that the vineyards attempted in England have generally failed, for we shall see that while they were planted at random, there is not one spot in a thousand that can answer.

### CHAP. V.

#### *Of the condition of the adjacent country.*

**W**E owe to that great light of modern philosophy, Dr. Stephen Hales, the proof of what was long supposed before it was certainly known, namely, that plants imbibe a great part of their nourishment from the air. This is a very essential article to the vine; for its fruit is greatly affected by the state of the air. We have seen that warmth and dryness are the great requisites in the soil, for the perfecting the juices of this fruit; and we may be assured from the last observation, that the same qualities are required in the air.

It is certain, that in the vine countries the temperature of the air is of this kind, much drier and much warmer than in England; and we may also find by experiments, that the air in some parts of our own country is much warmer, and drier than in others.

Two things fill the air with damp cold vapours, these are standing waters, and large plantations of trees. Therefore if a piece of ground be ever so proper in itself for such a plantation, it must not be used for it, if there be these objections in the adjoining countries.

No man would plant a vineyard in the fens, because the roots of the vine which ought to spread just under the surface, and within the influence of the sun, would there run to an immoderate depth; nor should he any more plant it in the neighbourhood of such places, for the air being rendered damp by the exhalations from the wet ground, the bogs and ditches would make the juices watery.

Some have thought neighbouring woods an advantage, because they broke and kept off winds; but the mischief they do by the great quantity of watery vapours continually exhaled from them, is more than equal to the advantage of the shelter.

It is necessary a vineyard should be sheltered, but it should be by distant hills, not by near forests. The great care is defence from the north and west points; but this must not be sought at the expence of a mischief, at least, as great as would arise from the exposure.

The planter now sees exactly what he is to fix upon as the spot for a vineyard: the very gentle descent of a rising ground open to the south east, sheltered by hills at a due distance to the north and west, with a warm, light, and not rich soil, and with a dry bottom, where there are no large plantations of trees near, and where there is no great quantity of wet ground or standing water.

The hills which defend the ground must not be so near as to close it up, for then the winds would not have scope to blow freely through the plantation, which is an essential article; and though large stagnating waters are most hurtful, if there be a swift brook near the bottom of the ground, it will be an advantage. This compleats the articles of soil, situation and exposure. He who has not a piece of ground with these advantages, should not think of a vineyard; he who has, may promise himself success in the plantation.

This is all which concerns the gentleman planter; but to the husbandman, one consideration is necessary more, which is, the place being so situated, that he can sell the juice.

The grapes raised as we shall direct, on such a spot as this, will afford an excellent and rich juice, capable of making



making a valuable wine, and we shall add how that is to be done; but the farmer should have no farther trouble than raising the crop, and pressing the juice. There are people in England who always know what to do with it. The juice of the grapes from the vineyard near Bath, was sold as it came from the press; and near such a town as Bristol or London, there will always be a demand for it. The wine coopers, and certain others, always know what to do with it. Without this advantage it is not worth while to raise vines as an article of profitable husbandry, for the farmer can employ his time better, than in conducting the making it into wine.

This will determine also the quantity of ground to be planted when a proper spot is found; for unless there be this advantage of a ready sale for the fresh juice, a little ground will raise vines enough for all other occasions. When there is that demand, a large quantity of proper soil may be very wisely employed for this purpose; for the expence of the common implements, so far as relates only to pressing the juice, is not great; and the ground will no way yield more advantage.

## CHAP. VI.

### *The preparation of the ground.*

AS the vine delights in an open soil, the perfection of the grapes will depend upon its being kept in perfect tillage. In order to this, it must first be brought into a good tilth, and a due portion of time must not be refused to this; nor sufficient and repeated labour.

The four coultered plough is the instrument, and if there be any addition necessary to the soils, this is the time to make it. If ground soil be ever so proper in its nature, but want some stony parts, if these can be had, it will be very proper to add them. They should be in pieces of about an inch broad, and flat. They come larger from the masons, but they should be brought to this size nearly by breaking with a mallet; and when this is done, they are fit to be worked in.

In autumn let the four coultered plow be brought into the ground. This instrument will cut to a greater depth than is needful here, therefore it must be set properly according to the quantity of soil. We will suppose this a foot deep, which is about a medium in what is proper for vineyards. Let it all be turned up and torn to pieces thoroughly with this plow; and then carefully wrought over with a harrow. This will draw out the roots of many of the weeds which the plow had cut up.

After it has lain ten days from this operation, let the stone chippings be scattered over it: and then let it be harrowed again.

The quantity of chips must be according to the nature of the ground, the mellowed it is the more it will want of them. These, or something of the same nature, should always be mixed in such quantity with the soil of a vineyard, that the roots, as they run among the mould, may frequently creep over and between them. These spongy, yet hard substances, receive a great deal of the sun's rays, and they keep a warmth in the roots, which is the greatest of all articles, in giving a richness to the juice.

After this, once in six weeks, let the ground be well plowed up, that is, four times during the course of the winter; and every time let the same care be taken of picking out roots of weeds.

In this manner it will have received the benefit of a most perfect fallow for six or seven months. The air will have mellowed it, and the tillage will have broke it so fine, that it will be in a perfect good condition for planting.

The season for this is spring, and it is to be done in the following manner.

## CHAP. VII.

### *Of planting the ground.*

IN the middle of March every thing must be ready for planting the vineyard. We have shewn in the account of the horsehoeing husbandry, the vast advantage of planting in rows with due distance; and in so large a growth as the vine, it is most of all necessary. The ground we recommend for this service is cheap, therefore it would be idle to plant the rows too close; a small addition to the quantity will give them the needful space, and then the plow will come in better between, and all the labour of the vineyard will be more conveniently performed, beside that the roots of the vines will have more room to spread, and the air a more free course between the plants.

We have shewn in the management of an orchard, that the flavour of the fruit in a great measure depends up-

on the free course of the air, not only among the several boughs of the same tree, but between tree and tree: and this is most of all essential to the vine, because its fruit ripens later, and obtains the true flavour more difficultly than any other kind whatever.

For these reasons let the space be wide between row and row: we have laid the reasons in this fair view before the reader, that he may not be surprized at our directing a much larger distance than is commonly given. If vapours be pent up among the vines, or if the rows shade one another, the grapes will never ripen. If the roots run too deep, we see the fruit suffers. And though we have ordered a kind of ground, in which they cannot easily do this, yet it will be proper to encourage the contrary by all possible means. And the more compass they have upon the surface, the less they will be tempted to force a passage downwards.

It is essential also, that the sun beams have full power upon the surface at a slight depth, under which these roots run; this will be in some degree provided by the course in which the rows will be directed to be planted; but the greatest means of obtaining this advantage is by allowing the full distance of which we speak between row and row. Having explained the cause of what is particular in our directions on this head, we shall proceed to give them. We have explained them thus largely, that all may see the reason of the practice.

Therefore, when the ground is fine and this perfect order, let the rows be marked out at fifteen feet asunder, and let them be drawn in strait lines running exactly the same course with the exposure of the ground, that is, south east. This will give the shrubs air and sun; and particularly it will lay their roots, as they run across these intervals, open to the full power of the heat upon the shelving surface.

The next thing is to mark the distances of the vines in these rows, and this should be two yards and a half.

The great article now comes to be considered of the kind to be planted. We have a vast variety of grapes in England, and the planter is happy if he will be guided well which to chuse.

In fruits in general there are sugary and sharp kinds, it is so in pears and apples; and the best for cyder and perry, are those which have least of that sweet mellowness which recommends them for the table. This our reverend correspondent has shewn, who favoured us with the treatise on cyder-making; and if we will trust their experience, who have given proofs that they know, we shall prefer in the same manner the hardest and roughest grapes for the vineyard.

They have in France, Spain, and Italy, rough and sweet grapes, as well as we in England: but the best wines are made there from the roughest fruit.

Those are idle who would limit the choice to any one kind, for we have several vines in England which equally produce these austere grapes; any of those may be chosen, but the great care must be to mix none of the sweet kinds among them; in cyder a mixture of various kinds of apples gives an advantage to the liquor, but in wine it is otherwise; the several kinds of rough grapes, which differ as varieties, not as distinct species, may be mixed, without damage to the wine; but if any one should plant in the same vineyard rough and sweet grapes, he would make a very great mistake: for experience shews, that the juices of these two kinds never mix well, or ferment properly together; though the juices of two or more of the austere kinds, or of two or more of the sweet grapes, will ferment as regularly, and make as good and entire a wine, as if the whole quantity of fruit had been gathered from the same shrub, in species and in name.

As to the article of planting, layers are altogether best for vines which are to stand against walls, but cuttings for those which are to be in the open ground. Therefore there is no question about this matter.

The last week in March let the holes be opened at the distance already directed. They should be fifteen inches broad, and their depth the full thickness of the soil, which, if the ground have been properly chosen, will be about as much, or something less. These being all opened, and the mould laid upon one side, let the cuttings be brought in.

They should be taken from vines of a good growth and cut off with a knot of the former year's wood with them; then they should be taken off at the upper part till they are about twenty inches long; and thus laid ready for the service. They should be placed with the thick part or knot of the old wood about three inches under the surface, and the rest above; but this is to be covered by a scattering of straw,



straw, or other light matter, to prevent its drying by the air.

When the holes are opened, the cuttings should be taken up and set to soak at the bottoms for eight hours in water. The best method is to take out of the ground as many as can be conveniently set in one evening; and to put them to soak about ten in the morning; then they will be ready for planting at six.

A little of the mould must be thrown into the bottom of the hole, and drawn up sloping toward one side. Then the cutting is to be laid slanting in, and the mould carefully poured in about it and settled to it. Then it must be raised a little in a hill in the places, for the length of the cutting will not permit its being wholly covered in this manner, and it is necessary that it must be under some mould above the uppermost bud, otherwise it will not succeed.

It is from this bud the future vine is to grow, and if the dry air parches it up before the cuttings begin to attract nourishment, it will perish.

The mould must be laid down about the cutting, and pressed close in the little hill which is raised for defence of the bud; and this is all that is required for the present. The ground has been just plowed, and there will for the present be no weeds. April is a showery season, so that no watering will be necessary, and thus all is to be left to nature.

When the cuttings begin to shoot, a slight stick of a yard long is to be thrust into the ground near each, to which the principal sprout must be tied up with some soft bafs; and this must be repeated at times, to keep it out of the power of hurt from the winds.

At the latter end of April weeds will appear upon the ground, and this is the notice of beginning the horseshoeing husbandry. Let the hoe plow or horseshoe be brought in, and the ground lightly turned up. It will destroy the young growth of weeds, and expose the mould to the air, with a new surface, this will be properly speaking its last fallowing: for the roots from the cuttings will not yet have shot far enough to have the advantage which will afterwards arise from this practice in breaking off their extremities, and throwing new mould about them.

A month after this, let the planter walk over the ground, and examine all his young vines; wherever there grows a useless side shoot, let it be taken off, that all the nourishment be carried where it is wanted; and once in six weeks let the ground be turned up between the rows with a hoe plow; and the weeds cleared between the vines in the rows with a hand hoe.

All this time the vines draw but little nourishment, but the earth being broken and fresh turned to the air by this repeated tillage, it is improving in its nourishing qualities; and there being no weeds suffered to grow to exhaust its strength, it will be in the most perfect condition, when the plantation most requires it.

#### CHAP. VIII.

##### *Of pruning the vines the first season.*

GARDENERS like surgeons, think they have most credit when they use the knife most boldly; but all extremes are wrong. The condition of these vines in autumn will be, that they have a shoot much longer than they can support through winter. The ignorant and careless who leave them as they are, expose them to the frosts, which nip the tops of the shoot, and then continue the destruction downwards, so as often to destroy, and always to weaken the plants.

On the contrary, those who have been tutored in the false school of gardening, cut them down to the ground, or very nearly so. These extremes are equally wrong: at the beginning of autumn let the planter mark the condition of his vines; and the last week in September let him prune them according to their strength, leaving two or three joints: and with a sharp knife and steady hand, cutting off the rest of the shoot.

Then let the ground have its last dressing for the season, in the spaces between the rows, and let the hand hoers, who cut up the weeds in the rows, where the other instruments cannot come, draw up a hill of fine mould five inches above the surface round the stem of every plant.

The ground may now lie six months at rest. But in the March following it must be again turned very well with the hoe plow, and the hills must be made up to every plant within half an inch of the lowermost of the buds left on.

The rains of spring follow, the ground is mellow and clear, it is suited to the nature of the growth, and the vines are in a condition to push with vigour.

#### CHAP. IX.

##### *The management of the vines the second year.*

ONE useful shoot is to be expected from each bud or eye left the last autumn; and no more are to be suffered. At the last dressing sticks of four feet long must be thrust into the ground, two or three to each bud: for one shoot only must be tied to each.

When the season begins to be warm, they will push, and this is the direction for once more plowing up the ground between them. The planter must not be alarmed at this frequent ploughing; or think from that the plantation requires an expensive management. The trouble is really very trifling, and the charge less than is employed on any other growth. The soil being light and in good order, these ploughings are very easy, and come very cheap; and the attendance that is required beside, during the growth of the shoots, is very little.

It will be necessary to go over the ground now and then to see the vines do not exhaust themselves in useless growth of side shoots. And wherever these appear, they must be rubbed off in the bud. The ground must be ploughed over once more during the summer; and at autumn the pruning must be repeated.

In this the strength of the vine must be regarded: and therefore no absolute direction can be given how much wood to leave. The strongest shoots should have three eyes left on each at this pruning, and this is the best state at which it is possible they can arrive. Two shoots from a cutting of the last year, which have strength enough to bear three eyes apiece, is the utmost growth and strength that can be expected: and this the culture here laid down, will generally produce and support. In the usual way of managing a new ploughed vineyard, half the cuttings shoot but from one of their eyes the second year, and many of them but very weakly even there, so as to require being cut down to two eyes in this pruning. In the horseshoeing method there pretty constantly will be two strong shoots from each cutting, which may be left with three eyes each.

#### CHAP. X.

##### *The management of the vineyard the third year.*

THE time of growth of the vines is so many years loss to the planter; but the rent of such ground, as we have directed to be used for them, is small: and the charge of attendance is also little. They will now be coming toward a state wherein they will amply repay the charge.

All the winter this year the land is to lie at rest, as during the last; and in spring it is to be well turned up again. Two strong stakes are to be driven into the ground at a small distance from each vine, and the two shoots are to be tied to these in a position slanting moderately upwards from the place where they rise.

The mould must be again drawn up in hills about the stem of each vine; and the ground must be twice more during this summer, turned and well broke by horseshoeing.

Now will be seen the great advantage of that practice. The ends of the roots will be broken off in these hoeings, and falling in a fresh turned, loose, and unexhausted soil, there will shoot out from every broken extremity a number of more roots and fibres: these spreading horizontally among the fresh mould will run at liberty, and the influence of the sun will be strongly upon them.

The vines will shoot vigorously from all the eyes on the stems, and the care must be to rub off weak and ill placed shoots, and to favour and support the strong and hearty ones, by tying them up to the stakes.

Thus will the growth proceed well, and no straggling branches being allowed to exhaust the roots, all the rich nourishment received by them, will be employed in forming good wood. This will then shew itself from time to time, and not being starved or shaded, it will harden as the bearing shoots do in more favourable countries.

Indeed, by what I have seen, the difference of climate may very well be equalled by good management of the growth; and vines in England will thus shew themselves in the same state wherein they appear in more southern countries.

The summers in the wine countries are drier than in this island, and the air is less loaded with fogs. Therefore the young shoots of the vines are harder, because they are surrounded by a drier air. This is the real reason; and this shews how we should regulate our plantations for obtaining the same advantage. As damp is the article to be feared, we should give the sun and air free passage between, about, and



and among the vines; this is contrived by our distant manner of plantations, and it will be promoted greatly by observing to displace the useless shoots, which will, during this third summer, rise from the stems among the good ones. The abundant nourishment given by our method of culture, promoting the free growth of the plants, encourage this; and it is the purpose of the work to give that nourishment, not to such useless parts, but to the essential. This is done by rubbing off all false shoots as soon as they appear; and the good consequence follows also, of preventing the proper shoots from being shaded, which would make them weak.

This is the care required during the growing months, and with this the vineyard will make the greatest possible advances.

In the course of this summer, each of the branches left at the last autumn pruning, will have formed three good shoots. These are to be left on for fruiting, only taking them at the proper time in the succeeding autumn. The next season, being the fourth, is the proper time for their bearing for advantage.

The new wood having been open to the air, and well nourished during summer, will be firm and hard at autumn, and the pruning is then to be done in this manner.

The uppermost new shoot must be pruned, so as to leave it three eyes; and the others, to leave them two each; in this state the vines will be of a very firm strength for their age, and they will be in a condition to bear largely the succeeding year. When the vines are thus pruned, the ground should be lightly turned once more by a single furrow in the middle of each interval. This destroys the autumnal weeds, and they will rot and make a kind of manure. No more will grow during the succeeding winter, and the ground will have the advantage of a fallow for that time. This will put it in perfect good condition for the following years important growth.

The quantity of wood we have ordered to be left on, will produce no mean allowance of grapes: more might be obtained that year by leaving on an eye more on each shoot, but this would exhaust the roots.

Patience in regard to the produce is the great article in the management of a vineyard; and he who should push the roots to their full bearing this year, would hurt them for many to come.

After this they will be too well established for damage. The common error in gardening is letting fruit trees bear too much while they are young. It is the fruit in all plants that most exhausts the root; and at this period it is very ill husbandry to suffer it. He who permits his wall trees to be overloaded one year, sees them empty the next for that very reason; and this is the true account of what is said concerning trees bearing every other year. The full season exhausts the roots, so that they can do nothing the ensuing; but producing little that year, they are recruiting for the succeeding. This is the course of nature, who, when she is forced by made ground, requires art to thin her products. In these cases the fruit is never perfect when it is loaded on the tree; and beside the damage by exhausting it against the succeeding year, what is thus erroneously kept on, spoils the taste for the present. In our grapes of the vineyard it is exactly the same, he who will be content with a moderate produce the fourth year, will have that fine in its kind, and will lay the foundation of very rich seasons to come; whereas, if the planter, according to the common practice, pushes for a large quantity this fourth season, which is properly the first of regular bearing, he will have the fruit bad that year, and weaken his vines for three or four following seasons.

## CHAP. XI.

### *The management of a vineyard for the fourth year.*

**E**ARLY this spring good stakes must be provided, and they must be driven firmly into the ground in such number as the shoots require, and at the utmost distance they will bear. To these the shoots are all to be fastened in the same manner as at first, in a moderate and natural position, about the middle degree between upright and flat.

This must be done with care, and when it is finished, the hoe plow must be brought very carefully into the ground. This hoeing is more essential than any of the former. The trampling the ground in tying up the vines, has rendered it necessary in some degree, and the use of new broken mould about the roots of plants, is well known.

All weeds being thus cleared away, and every thing in order, the first settled warmth will fill the eyes of the vines, and they will shoot strong. The planter must now look carefully over them from time to time, and all offers to shoot in

wrong places must be rubbed off as soon as they appear. The tying must be continued as the proper shoots encrease in growth, and in this caution must be used to keep them at a due distance above one another, and to give the air free passage every way among them.

The shoots which shew fruit must be suffered to grow only to three joints, beyond the place where the fruit is placed. Thus much is necessary, and it will only serve the fruit by drawing sufficient juices to the parts; more would exhaust the nourishment to no purpose. The fruit will thus be shaded by those leaves which properly belong to it and no more, and it will constantly have the same degree of shade, which is a thing of great consequence; for when the useless shoots are suffered to shelter it a considerable time, and then removed at once, the change of condition is too great. The fruit receives a check in its growth, and we know, from a thousand instances, that when this is the case, it never will have the true flavour. The pine apple is a most striking example of this truth. Its culture is so delicate, that very frequently it receives checks in the growth. When this happens after the fruit is set, it never has a fine flavour, though it ripen to appearance very favourably afterwards.

It is the same with the fruit of the vine, and we give this instance that the planter may be assured of the truth. The way to keep the grapes in a regular state of growth, is to rub off all useless shoots in time, before they have attained any size or strength, and by repeated hoeings to keep the ground in a good condition for giving nourishment. Thus the growth will continue regularly from the first setting to full maturity.

The planter now sees what are the several requisites to this; and he must not expect success, unless he take this proper method to obtain it. The pruning must not leave too much bearing wood, that the fruit be not too much in quantity for the strength of the vines; the ground must be kept in tillage while it is ripening, and it must have the same degree of sun and shade throughout that period. Thus will it have all the requisites; and England may ripen grapes as well as Burgundy.

This may be done in the common method of keeping vineyards, but our proposal by the hoeing offers something more. We know the giving nourishment to fruit while ripening, is the great article in its perfection, and it may be done by this, though it cannot by any other kind of tillage, nor is the repetition of the plowing, upon that occasion, to be accounted a hardship.

In the common management of vineyards, the hoeing takes off the weeds for the first three years, and the spring of the fourth, or first fruit year, requires that the ground be dug with the spade. Every one knows this is the most expensive of all kinds of culture, and in a large ground it must fall very heavy on the planter; nor can it with any reasonable prospect of the crop paying, be done more than once.

Our method of hoeing may be very well performed twice; and I have found upon a fair computation, that all the hoeings of the four years, do not amount to so much as the handhoeings, and this expensive digging by the spade.

The vines will be in a better condition all the time in the hoeing method, because the ground is kept in better tillage, and in this fourth year there will be the advantage of giving them a new supply of nourishment just when they want it, for the perfecting of the fruit.

We suppose our vineyard now in the fourth summer, in the common way the ground has been dug up this spring; in the new method, it has been carefully wrought with the hoe plow, the consequence is much the same: the useless shoots being rubbed away as they appear, and all the nourishment conveyed to the fruit, it swells and makes the first advance toward ripeness favourably: but it requires more nourishment, and better, to perfect it from this middle state of growth, than it did to bring it so forward.

All ground, from the time that it is tilled, grows more close and heavy again till the next tillage; from the spring digging to the beginning of August this ground has been therefore growing worse and worse; it has thus far furnished the grapes, but they now want most supply, and it is least in a condition to give it. Little or nothing can be done in the common way to assist it; but in ours, just at this needful time, the hoe plow can be sent into the ground; and this must never be omitted.

The consequence will be surprising. In the first place all weeds are torn up and destroyed by it; and this is no small advantage; beside exhausting part of the nourishment at a time when the vines want it all, they thicken the air with vapours: for all plants perspire. This is the worst ac-



cident that can happen to grapes ripening in England. In other countries the air is drier than in ours, and that is one great cause of the success of their vineyards. We have an air naturally too damp to combat with; and having as much as possible avoided this in the choice of ground, we shall now do the growth a most acceptable service, by clearing away all other plants which grow among the vines, and would, in some degree, infect the air by their perspiration.

This is one advantage of a good horsehoeing given to the vineyard in the beginning of August: but the greatest is the supply of nourishment, given by it to the fruit, just when it is most wanted.

We know fruits may be nourished by manure and watering, but the vine is an enemy to both. The sweetest nourishment for all fruits, arises from a good tillage of the ground alone, and this is the only assistance of that kind, the vine will receive with benefit: this horsehoeing in the beginning of August answers the purpose perfectly. The ground is all well broken, and by this means rendered fit to receive the rains and dews: the extrem fibres of the roots are broke off, and twenty or more new ones are sent out into the fresh dug mould in the place of one. These all receive juices for the fruit; and those juices are meliorated by the sun's rays warming the ground in which they run.

We have shewn the mischief that arises from the roots of the vine piercing too deep into the earth: the juices they imbibe are cold and poor: the only proper nourishment is what they draw from mould which lies within the influence of the sun.

The roots of the vine in their extrem fibres naturally push downward, and there is nothing so disadvantageous to the grape, for these extrem fibres draw the principal nourishment.

Now in the last horsehoeing of this season, this is naturally and most happily remedied. The plow piercing to a considerable depth of the soil, tears off the roots at that part, where they would run deeper; and those fibres which would have drawn a cold and hurtful nourishment for the vines, are thus cut off. The plow which has come under the roots, whose ends it thus tears off, gently lifts them up, and in its natural course spreads them horizontally in the new broken earth, nearer the surface, and consequently in a part where they are in the reach of the sun.

Every thing is thus done that can be wished for the filling and perfecting the fruit, and with the advantages named already of an open spot and distant plantation, this gives the benefit of more favourable climates. The soil is proper in its kind, and it has all the advantages of tillage. It is new wrought just when the grapes are coming to maturity; and the deep fibres of the roots being taken off, thousands, indeed millions of new ones are sent out from the ends of the others, and these run horizontally, or nearly so, in a fresh soil, warmed by the sun beams. They therefore attract a fine and abundant nourishment, for the freshness of the soil always gives that; and they lie so, that this can be warmed and improved by the sun before it is carried up into the fruit.

#### C H A P. XII.

##### *Of gathering, cutting, and pressing the first produce.*

**T**HE first year's fruit in a vineyard is usually small in quantity, and inferior in quality to what it yields afterwards; but in the management we have directed, there will be less of this difference than would otherwise happen. It is, however, a very comfortable assurance the proprietor may give himself, that every year, so long as he lives, his vineyard, if he continue the proper management, will produce more grapes, and those better than the last.

What is to be farther done this first season, is this. When the grapes have acquired their full bigness, the stalks on which the branches grow, should be cut about one third part through. The reason of this practice, whose use we see plainly in common wall grapes, is this. The quantity of nourishment that was required for swelling the fruit and bringing it to a due fulness, is no longer needed now; and the more comes in, the more difficulty will it be ripened. Therefore, by denying passage to a third part of the juice, which would naturally come into the fruit, our languid autumnal sun will be the better able to ripen what there is. When the grapes have in this method attained all the perfection whereof they are capable, let them be gathered with care.

They are to be pressed, but that should not be done immediately. It is not the method used with any fruit, from which a vinous juice is expected; and why should the

grape, which is the tenderest and most delicate of all, be denied the management which we allow to the most common.

In the cyder counties, when the apples are gathered, they are not carried immediately to the press; for if they were, we very well know how poor a juice they would yield. They are laid up in heaps to ferment a little within themselves, and their juice is thus rendered more pure and spirited than while it was growing.

Even in the pears and apples which are gathered for keeping during winter, for the service of the table, the same method of improving their juices is employed: and experience shews, that without it, they will neither keep so well, nor have their proper flavour. Those which are preserved in jars, or baskets, are not put into them from the tree: they are piled up together in heaps and covered with flannel, and after they have thus lain to sweat, as it is called, they are of a finer flavour, and are proper for keeping.

What is thus done for the apples and pears intended for cyder and perry, must be allowed also, so far as the nature of the fruit will permit, to the grape.

We have begun the practice by cutting through part of the stalks as the branches hang upon the vine, and being gathered, they must also have time to mellow before pressing.

The grape is of a tender structure, and cannot be thrown in heaps as pears and apples; and even if spread upon the ground, it will grow mouldy where it touches. But its natural structure in the bunch gives us an opportunity of easily hanging it up; and this way it will obtain all the expected improvement.

Let some lines be stretched across a barn, and the bunches hung upon these at a small distance from one another. The air should have its free course through, and the fruit will thus in a few days pass through that natural and requisite condition of sweating and evaporating the more watery part of its juices, and improving the remainder by this soft and gentle fermentation. They should hang about a fortnight in this manner, and they will then be fit for the press. This we speak with regard to the husbandman who plants his vineyard for the immediate profit; and can allow no farther attention to the subject, than the pressing and selling the juice. For the gentleman who intends the vine for his own table, they may have a week longer with great advantage.

The husbandman will have his juice less in quantity the longer the grapes hang, but he will be no loser by this, for the quality will be so much improved, that it will bring him a better price.

Without this care the wine cooper will not find it answer his purpose, and the husbandman will be obliged certainly to abate his demand; and probably will lose his customer.

This I have seen in England, where the ruin of a large vineyard, which might have brought great advantage to the owner, was the consequence of pressing the grapes immediately from the vines.

This time and management must be allowed the grapes by him who raises them only for sale of the juice; and this is our material consideration; we shall therefore proceed to the management of the vineyard for the following years: but having gone through that article, we shall lay down the management of the fruit in a particular manner for the service of those who intend to make good wine in England; and give the whole process.

#### C H A P. XIII.

##### *The management of the vineyard during the following years.*

**T**HE next care after gathering the grapes, is the autumnal pruning of the fourth year. This is a very material article, for on the judgment that is employed in it, will depend the succeeding years success.

The roots are now so established, that very luxuriant growth of branches must be expected; and this the knife is to retrench.

The common error is leaving on too much bearing wood; and the temptation is great, because the more fruit will be produced: but the roots will be impoverished by too large a bearing; and the juice of this greater quantity will be poor, and of less value than a smaller quantity which the roots could better feed, and the sun more perfectly ripen.

We shall allow the husbandman, who raises his vines for the sale of the juice, to leave on somewhat more wood than we advise the gentleman, who intends wine for his own table: for without exception the smaller quantity his vines



vines produce, provided they are well nourished and kept in good order, the better the wine will be; and in the same manner, the more he diminishes that quantity by letting the grapes hang after they are gathered, the richer it will be.

The fault of English wines is their poverty: those who will be content to make less, will avoid that imperfection. The better care is taken of the vineyard, the more wood may be left upon the vines. In the way we have proposed of large distances, the hoe plow and no intermediate growth, each vine may very well be allowed six branches, and of these, the two upper ones, may have six buds or eyes left on in the pruning, and the four others, four buds each. This will lay the foundation for a larger stock of fruit than vines are allowed to bear even in the wine countries; but the support from the horseshoeing method will be sufficient to bring all these to perfect maturity.

In England it has been the custom to leave on a great deal more bearing wood than this; and that with a very indifferent management of the ground: there can be no wonder, that in this case the produce has been poor, raw and watery. This ill practice has brought disgrace upon the wines of England; and many have given up the hope of ever seeing good made here; but whoever will follow the attempt upon these principles, understanding the reason of all he is expected to practise, and observing it regularly, he will find to his own satisfaction, and may inform the world, that the fault has been less in the climate, than in the conduct of the vineyard.

The weeds having been destroyed by the August horseshoeing, there will not be any of consequence afterwards for that season; so that when the pruning is over, the vineyard may be left for the winter.

The last week in March the hoeplow must be sent in again; and it will be a great advantage to dig up with a spade, the space between vine and vine in the rows where that implement could not come. Then the stakes should be examined, and the tyings, to see that all be in good order and security. And after this, the ground may be left to the middle of June.

It should then be again horseshoed, and a third time in August, and this is all the management it will require for a considerable time. But in the course of things in this world, nothing can remain long without a tendency to decay. If the vineyard had no recruit of materials, it would by degrees be exhausted. Many suppose the immediate nourishment of plants is the substance of the earth itself in fine particles; and if this be the case, the cause of a piece of ground being absolutely exhausted by a crop continuing long upon it, is very plain. Even the horseshoeing method, if all were true of it which its enthusiastick promoter, Mr. Tull advances, would not for ever supply the vineyard with nourishment. He says, corn may be raised for ever on the same field without manure by this method of husbandry; but if this were literally true, it would overthrow his whole system. If he only means for a great number of successive years, using for ever figuratively, still though that should be true of a corn field, it will not answer in the vineyard. His method is by sowing every succeeding year's corn in the centre of the last years interval or space between the rows; so that it really does not grow any two years upon the same spot of ground, though every year in the same field; but in the vineyard we can have no advantage of this change of place for the crop: because the vines must stand all the time where they are first planted; and their long standing is indeed their greatest advantage.

The horseshoeing method makes the soil last serviceable much longer than any other practice could, because it keeps down the growth of weeds which would exhaust it, most effectually; because it exposes the mould frequently with a new surface to the rains, dews and air, which are its true and great invigorating principles; but most of all, because in these large intervals, it continually changes the quantity of mould which lies about the roots of the vines, and is exhausted by them.

For these reasons, the horseshoeing husbandry will continue a well chosen piece of ground a long time, in a condition to support the growth of the vines: but when we consider the original preparation of the ground, we shall find it must by degrees decay, and that a recruit must and will be wanted.

The quantity of soil was originally not very great, for it was an essential article to chuse a piece of ground where there was not too much depth of it: the vineyard lies on a descent; and consequently, if we allow no absolute waste of the mould from the plants themselves, the rains will in a succession of years, wash some of it away. The mould is often broke, and the water, which falls in showers, has

a free course off down the intervals: it will run off thick and muddy, and this mud is no other than the finest part of the mould of the vineyard. This is a continual waste; and there is no new supply: the vineyard therefore, which had no more than a due quantity of soil when first chosen, must after a few years have too little.

Another certain consequence of the allotted culture is this. Those chipings of stone, whose use we have explained, will, by the frequent tillage, and the power of rain and air, be by degrees reduced to powder; and no longer operate as they at first did. The soil will therefore be exhausted and washed away of its richest mould, and a quantity of the grit of stone will be left in its place. The soil is no longer what it was, and consequently, if it was well chosen at first, it will be improper now.

Here then is the evident necessity of a recruit; it will be required the sooner where the ground has a greater descent; and in those vineyards where the rows are at less distances than in such as have the spot better chosen, and the plantation made upon rational principles: but sooner or later it will be required in all. And the method of giving it is this.

#### C H A P. XIV.

##### *Of recruiting the soil in a vineyard.*

**W**HEN the eye finds the soil to be impoverished, or the condition of the fruit shews it; the manure must be this. Mix three loads of pasture mould taken from under the turf, in a piece of high and not very fruitful ground, with one load of fresh chipings of stone from a mason's yard; and four bushels of lime. Let these be thrown together in a heap in autumn, and in the succeeding February, scatter them over the ground.

These are the proportions of the ingredients, and the quantity may be increased to serve any vineyard according to its extent.

It is to lie upon the ground till the last week in March, and then to be ploughed in by the hoe plow, when brought into the ground at that season in the usual course of tillage. It will be, in a great measure, mixed with the soil by this first operation; and every time the horseshoeing is repeated, it will be more and more perfectly blended with it.

The effect will be seen in the growth of the vines, and tasted the very first year in the juice of the fruit. From this time, the usual course of management in tillage and in pruning, is to be continued; and according to the nature of the ground, this refreshment is to be repeated after a succession of years.

Every spring the stakes must be secured. Those should stand at a foot and half from the stems, which are to have the bearing branches tied to them, the others for the under shoots near the body. The care of rubbing off all shoots that offer in wrong places, must be repeated; and the branches intended for the next year's bearing, must be taken off at the ends, when they have so much growth, and the season is so far advanced, that they will not be likely to shoot out stragling branches from the eyes.

Thus is the care of the vineyard every year the same; and being once understood, it will be performed afterwards, by the most ignorant labourer, with ease and regularity. The time lost at first in the three years growth of the vines, before they bear fruit, is all that is lost; and each succeeding year will make ample amends for that: the expence of the horseshoeing is all that can be reckoned of consequence, and this comes very cheap, because the soil being light and loose, it is performed with great ease and expedition.

With regard to the gathering and hanging up, women may perform that; and the pressing is an article scarce worthy being brought into the account.

Although no error is so great as that of desiring too much fruit, the quantity which will be produced in a regular management this way, is vastly beyond what they might imagine, who have not had opportunities of observing it: and the first profit, when the juice is sold as it comes from the press, is equal to what could be obtained by the best crops and best management on this ground; and twice or three times as great as would be obtained in the common course of husbandry.

This is a point at present of great importance, as the planting of vineyards is become an object of the attention of a society the most useful in its purpose, and the best conducted of any yet established in this kingdom; that for the encouragement of arts and commerce. These gentlemen have extended their care to the American colonies; and rewards will be given to those who most successfully shall manage vineyards there.



It is an object of great consequence to the kingdom ; for there is no question, but in the extent of that vast space, there will be found many places where vines will succeed as well as in some of the countries, whence we have now excellent wines. I shall be happy, if this detail of the culture, and management of the ground, may be of use to those who shall there, as well as in England, make the experiment.

Agriculture, which in England, has made but very slow advances toward perfection ; is there yet in its infancy : and perhaps the methods, by which this, and the several other branches of it, are to be improved, will meet with an easier introduction there, because they will have fewer prejudices to oppose.

The new husbandry with the horsehoe, is not only very happily calculated for this purpose, but is successfully used in the vineyards of many countries, whose produce we admire : and they who bring it into practice for one article, will soon use it for others.

## CHAP. XV.

### *Of making of wine.*

THE husbandman who plants his vineyard for the immediate profit, by the sale of the juice, has before him, in the preceding chapters, all that he need regard upon this subject. But there is yet a great deal to be said to the gentleman planter, who having leisure and opportunities, will employ them in perfecting the juice of the grapes thus raised, into wine : he may very likely arrive at a degree of perfection much exceeding what he conceives at first, for the materials are before him, with which very fine wines are made in other countries ; and with the same care, there is no doubt but very good, if not equal to the others, may be made here.

We have given the first caution, which is, that he do not spoil all, by endeavouring to get too much. This care is to go through the whole operation, from the pruning of the vines, to the finishing of the wine.

The husbandman, who is not concerned in this article, may, at one or two gatherings at most, clear his ground : nor will the person who buys his juice find fault on that account ; but where the perfection of the wine is intended, there should be many gatherings. One pressing will answer to all these, for though the bunches be gathered at separate times, they may be kept so long hanging, that all may be pressed together.

Reason directs us not to gather the grapes too soon ; and it is as wrong to let them hang too long : but this is a danger to which we are not much exposed in England. As we have seasons however, in which grapes of the earlier kinds ripen before the end of autumn, it is necessary to add, that when this happens, they must be gathered accordingly, and not left upon the vines ; for the strength of the juice will evaporate after this, and they will be continually of less and less value.

For this reason, when the time for the first ripening is come, let the vineyard be watched, and let lines be drawn across a barn at distances, for hanging up the bunches. Though no sun must be admitted, there must be a free and dry air in this place.

In some of the wine countries their grapes will bear hanging up in the sun, after they are gathered ; but ours will not without damage ; there it is only improving the juice, with us it spoils, and renders it vapid. The reason is plain, the grapes have there had more of the sun while growing, and therefore they can bear it better afterwards.

The method therefore in an English vineyard must be this : let the stalks be half cut through at the time we have directed the husbandman to cut them through a third part ; and after this, as they ripen, let them be gathered, and hung up.

The time of the day for gathering is a very important article, and a great deal of advantage is lost by not regarding it.

All fruit grows soft, and in some degree vapid, by the heat of the sun, and there is great difference between the condition of the same peach ; for instance, at two o'clock in the afternoon, and at eleven in the morning ; but much greater between its condition an hour after sun-rise, and two hours after mid-day.

We are particular in our directions, because what appear to be little articles, determine the goodness of the wine, and that we may carefully observe, we shall endeavour to make ourselves perfectly understood. The difference in fruits is obvious at these hours, and the cause is this.

Plants are nourished by their roots, and by their leaves. The roots draw their juices from the earth, the leaves

from the moisture in the air. The heat of the sun sets these in motion ; but it also evaporates them.

From the time the sun begins to shine with strength, the leaves droop, and the fruit grows flaccid ; this begins two or three hours after sun-rise, and continues till near sun-set. In all this time the fruit evaporates more than it obtains, for the power of the sun upon it is great, and the same heat dries the earth near the surface, where the roots should obtain their juices, and evaporates that moisture in the air which should supply the leaves. Therefore the fruit being at once exhausted of the nourishment it has, and denied the means of fresh, grows soft, and in some degree dead. This happens from the time the sun has power in the morning, till it loses it in the evening : and all this part of the day fruit grows worse and worse.

As soon as evening comes, the chillness of the air stops the evaporation ; and both the earth and the atmosphere abound with moisture for nourishment. This continues through the night, and all this time the fruit is gathering again strength and fullness.

At the time of sun-rise, it is in perfect fine condition, and continues so till the heat has again power upon it. Just at sun-rise the grapes will be wet with the dew, which will subject them to mouldiness if gathered then ; an hour after they will be sufficiently off, and the grape will yet be for two hours longer, or near so much, in the full vigour of the night. This shews that the time of gathering it should be begun soon after seven o'clock in the morning, and continued till near nine.

It will be proper to employ cheap labourers, as women, to go into the vineyard every morning at the season, and gather such as are ripe during these hours ; they must be carried to the barn, and hung on the lines stretched for that purpose, and if any decayed or bruised grapes are seen on the bunches, they must be taken off.

The several gatherings may all be pressed together, for the longer the grapes hang, provided no part of them begin to decay, the better ; a month is, in general, a good time for the whole, or so many weeks counted from the middle gatherings.

All this time the air must have a free passage, and from time to time any decayed grapes that are observed, must be picked off. If either of these cautions be neglected, the consequence will be great damage to the wine : if the decayed grapes should be suffered to remain on the bunches, and the place be also kept close, they would taint the whole.

When the quantity of grapes has hung the appointed time, let the press and vessels for the wine be got ready, and perfect cleanliness observed in both. The grapes must be picked clean from the stalks, and all imperfectly ripened ones must be thrown away, together with such as are any way damaged. There will be thus a quantity of clean, sound, and nearly equally ripe grapes, in a condition for pressing. This must be done by degrees, but sufficient time allowed to get out all the juice.

The next management depends upon the intended colour of the wine. The skins give this colour, and if it be designed to make red wine, they must be mixed in the fat with the juice, and stand in it six days. If it be designed for white wine, this is to be omitted. Only as the skins will assist in bringing on a fermentation, they should be put in for about eighteen hours.

The juice, soon after it is pressed, naturally undergoes its first fermentation. If this do not come on regularly, the doors and windows must be shut up, and if this do not bring it on in a few hours, there must be a fire made in the room, to give more warmth to the air.

When this fermentation has come on regularly, and had its time, the wine must be drawn off into another vessel, and loosely covered ; and after standing three days in this, it should be drawn off again.

When the fermentation is tolerably over, the wine must be drawn off into casks : these must be quite filled, and the bung-hole must be left open.

Some degree of fermentation will still continue ; and there will rise a skum upon the wine. Great care must be taken not to break this, or mix it with the wine, for in that case it will be foul a long time.

The casks must be watched from time to time, and some of the wine must be kept apart, ready to fill them up as they waste ; this must be done with great care not to break the skum, and they must be kept constantly full.

Five weeks after the putting the wine into the casks, a bung should be prepared, with a pewter pipe of two foot long in the middle of it. This bung should be put into the bung-hole, and thus the opening will be much lessened. Some wine must be carefully poured into the tube, till it is full



full half way up; and it must be kept in this condition as it waxes.

The place where the casks are kept must not be too warm, for that will continue the fermentation longer than it need be preserved, and the wines will be the worse for this.

When the fermentation is perfectly over, the wine is to be stopped down; and will require only time to perfect it.

Many articles must concur to make good wine any where: and the less favourable is the climate, the more care is required. We have directed a strict attention to all the articles which tend to improve or to hurt wines; and may promise, that he who follows them carefully, will not fail to make such wine in England, as none will be brought to believe was made there.

#### CHAP. XVI.

##### *The care of wines in the cellar.*

**I**T will be necessary sometimes to draw off the wine from the cask into another; and the best time for this is toward the middle of winter, chusing, for the purpose, a still, calm day. This takes it off from the lees; and if it be required, the same may be done again in February. After this it may stand till the time of bottling.

If there be any foulness in the wine the last time of drawing off, some isinglass will prove a remedy for that fault. About two ounces is enough for a hoghead, and it should be first carefully melted in some of the wine, and then mixed with the whole in the new cask, stirring it together with a long stick.

After this, the wine will become in a little time perfectly clear, and with right management will be in no danger of more fermentation or foulness.

The coolness of the cellar where it is kept, is a great article, while in the cask; and when it comes to be bottled, the weather in which that is done has great effects.

A damp air, whether it be warm or cold, will greatly hurt the wine; for it is and must be exposed to the effects of the air in bottling. Therefore never let this be done but when the air is dry and the wind in the northern quarters. Neither cold nor heat are of any great consequence in this respect, provided the temper of the air be regarded.

When bottled, let a great deal of care be taken to cork it well, and it is a good caution to cut down the tops of the corks smooth, and seal them over. Then let the floor be covered three inches with dry sand, and lay the bottles sloping on it. Saw-dust is generally used, but it is apt to heat in some places.

## Additional Articles in HUSBANDRY.

#### CHAP. I.

##### *Of the proper time of cutting wheat intended for seed.*

**A**CCORDING to the nature of the wheat and the services for which it is intended, the judicious farmer should chuse a different degree of maturity for the cutting of it. In general in England we let corn stand to be ripe before we cut it than they do in other parts of Europe. We are fond of alterations, which we naturally take for improvements; but they do not all deserve that character. The Italians, who cut their corn before it is full ripe, follow the practice of the old Romans, who managed the same fields: and though our custom of letting it stand longer be better suited to the nature of our climate, yet it is not always best: let the careful farmer follow these rules. Let him examine the condition of every field before he resolve upon early or late cutting of it; and in some cases let him also consider the use for which he intends the grain.

The two uses of wheat are for seed, and for sale. In general, that which is for sale should be cut earlier than what is for seed: and as a change of seed is highly useful, he will do well to establish a correspondence with some honest farmer at a distance, and agree mutually to select the most proper wheat as it grows for seed for each other; and to let it stand somewhat longer than they would suffer any other to be upon the ground.

No seed of any kind will grow favourably that has not been fully ripe before it was gathered: therefore the wheat intended for seed, should stand its full time upon the land.

The first hardening of seeds is a great article in their preservation with respect to growth; and they never receive this first hardening, so well as in the state of nature.

Any fermentation which comes on in a seed after it has been gathered, endangers the principle of life in it; and this is more likely to happen when the plant has been cut before its seeds were perfectly ripe, and they have therefore been exposed to the air before duly hardened, than when they have been first put in a condition to resist its influence by a natural drying on the plant.

Those slight fermentations, which happen from various temperatures of the air while corn is lying on the ground, or is in the shock which was cut before fully hardened in the ear, do not at all affect it in any other service but this of sowing: but the principle of life is so delicate, that it is often destroyed or weakened by what makes no other sensible alteration in the seed itself.

This points out to the farmer the necessity of a particular regard to the corn intended for seed; and there is also another substantial reason; the wheat for seed is probably to be thrashed as soon as brought in or very soon after; and if it be not well hardened in the ear, the grains will be bruised by the flail, and this way damaged in respect of the principle of growth.

Due hardness of the grain is the great preservative, and this must be obtained by suffering it to remain long enough growing; and by having it a due time upon the ground after it is cut.

Nature gives the gradual hardening much better than it could be obtained if the plant were cut too soon: because the vessels drying up by degrees, the pulp of the seed hardens in an equable and gradual manner.

In the hardening upon the ground after cutting, all that is done is an evaporation of the juices which are in the corn; but that which happens while the grain remains in the ear and the root in the ground, is effected partly by nature's denying the supply, and partly by that evaporation. In this case the evaporation is more gradual, and consequently the starchy part receives that condition wherein it is capable of being preserved more gently and more safely.

These are the reasons of the farmer's practice with regard to his corn intended for seed. He should suffer it to remain growing till it is perfectly well hardened in the ear; and he should then cut it in the morning of a bright day; not letting the reapers go into that part of the field till the dew is off.

He must then see it laid so as it may best dry; and it must be turned oftener than any other need be.

There is some care required in this, but very little trouble; and upon these little articles as they are thought, depends the great success of the business.

When this wheat is thoroughly dried, the sooner it is thrashed the better; and the benefit will be largely seen in the crop raised from it.

#### CHAP. II.

##### *Of the best time of cutting wheat for sale.*

**T**HE seed wheat being considered separately; we may now treat of the rest of that crop: and in this the owner will find more depends on the time of cutting than many imagine. Wheat which is cut when the grain is full ripe in the ear, has no advantage, except in the intent of sowing over such as has been cut three or four days sooner; and there are manifest reasons why it should not be suffered to stand so long.

Every part of this valuable corn has its use and price, and though the grain is so far superior to the chaff or straw, that it would be ridiculous to think of these at the expence of hurting the main product; yet, when they can be rendered better without injuring the grain, this is worthy the farmer's attention.

Let him understand the operations of nature. The growth of plants terminates in the ripening of their seeds. This is the final purpose in their production, and when this is achieved, the root perishes.

While the grain in an ear of corn is growing, its husk and the stalk are full of juices; but as soon as it is ripened, nature sends up no more nourishment, and these parts decay.

Therefore, when the corn is not fully ripe, the straw and chaff will be good, because they are parts of a growing plant, but when the corn stands till the seeds are full ripe, these parts are withered and useless.

Now it appears from experience, that the grain will be as good if cut a little before ripeness, and this will give that quality we wish to find in the straw and in the



chaff. It is for this reason a good practice in general, except where the wheat is for seed, to cut it down a few days before the full ripeness. It will harden upon the ground as well as in the growth, and the corn will be as good while the straw and chaff are better.

But beside this general reason, there are particular cases in which the early reaping of wheat is very beneficial.

Ours is so uncertain a climate, that we are never sure of good weather. The damages which corn gets by wet, when it lies upon the ground, is very well known: but this is greater if the wheat have been fully ripe before cutting, than when it has been reaped a little before. The reason is plain, that corn which has some moisture in itself, will get less damage by a little added from accident, than such as was before perfectly dry. In corn cut a little before ripeness, the wet presently is evaporated from the surface, and the flour gets no harm; but when full ripe corn is wetted on the ground; the quality of the flour suffers, and the weight is found also to be lessened.

In many cases the bad condition of a field pleads for cutting down the corn earlier than the usual time; and there is always an advantage: when corn is blighted, the best method is to cut it at once, though it be far from ripeness. As soon as the blight has taken full hold, the plant receives no more nourishment from the root; the stalks grow soft, and afterwards break with the least touch.

The best way is to cut this directly, and it may be then managed upon the ground while the stalks have some strength. The condition of the roots, which are loose in the earth, will not admit of its getting any farther benefit thence; but when the new cut ends of the stalks are exposed to the air, they imbibe a great deal of moisture from it; and the grain swells in the ear for many days.

The quantity from such a blighted crop will be much larger by this management, than it would have been if it had remained upon the ground; and the quality will be yet more improved than that.

One caution to be observed in regard to such crops is, that the corn must be threshed out as soon as it is in proper order; for it gets harm by being kept in the ear.

A second cause for cutting wheat sometime before it is fully ripe, is, when from neglect, ill management, or unconquerable accidents, the ground is weedy. In this case it is necessary that the corn should lie out for the weeds to wither. And this it will much better bear when cut three or four days before ripe, than when it has been kept on the ground till the corn is hardened to a full degree in the ear. We have observed that corn, not quite ripe, bears the accidents of weather after cutting, better than such as is fully mature: this is a condition in which the grain must be exposed to the weather longer than clean crops need, and it is therefore much the best method to take the advantage of cutting early.

The differences in the kinds of wheat, also make some variation advisable in this matter. The several species we have described already, and these do not all require the same conduct. The white wheat will bear to be left longer on the ground growing than the red, for the grains are firmer in the ear. On the contrary, the red wheat gets more good when it is cut; and for that reason, should be reaped sooner in the growth and left longer, and more carefully attended in the hardening.

The roots of the white wheat supply nourishment longer to the ear, and therefore there is advantage in leaving it longer growing. These things experience teaches, and the farmer has no guide so certain. In red wheat, when the stalk begins to grow dry, the growth of the ear is at a stand, and therefore it should be cut at that period; for we have shewn before, that the new cut stalks of corn will take in a great deal of nourishment from the dews and air, when the root would have supplied no more.

As this kind of wheat succeeds best if cut early, it will in that case, require longer attendance as it lies on the ground, but the expence is very trifling proportioned to the advantage.

The course of nature in all kinds of grain and other plants with jointed stalks is this: when new cut the vessels of the stalk are open, and they take in more nourishment from the air, than the roots would at that time from the ground; for the extrem fibres begin to decay when the grain has got its growth in the ear, and soon after the root perishes entirely. So long as these vessels continue open, and the knots or joints of the stalk retain their freshness, the nourishment is thus received, and carried directly up to the grain in the ear. All that is received must of necessity be carried thither, because the leaves, the husks, and every other part, are now past the period of their growth, and are withering. Therefore, so long as this condition of the

vessels of the stalk continues, there is an addition to the inner part of the grain; that is, the flour is augmented in quantity; and the increase, for the reasons given already, is much greater than it would be if the plant continued growing: afterwards the effect of the air is only to harden the grains, for when the knots deny passage to the juices, the stalk receives them in vain.

It is common to let white wheat stand so long before cutting, that these knots are dried while the plant is growing. But they observe a better practice, who cut even that kind while those parts retain so much of their nature, that juices can pass through them; and in regard to the red wheat, it is a rule with experienced farmers, always to cut it while these joints retain their freshness. It should never be suffered to stand longer in any soil; and in the driest lands it should be cut soonest, because in those soils, the extrem fibres of the roots dry up and decay earlier than in others.

If the weather prove damp while the corn lies on the ground after cutting, there must be a great deal of care in turning it; and in that case the grain will not suffer. The straw will be the worse for it, but that is a small consideration.

### CHAP. III.

#### *Of the proper time for cutting barley.*

THE corn kinds are all so nearly allied in their structure and manner of growth, that what is true of the one, will in a great measure hold good of the rest. The principal difference between barley and wheat in the structure of the plant, is, that the stalk of barley has the sap-vessels smaller. This is a reason why barley will have the same benefit from cutting a little before it is ripe as wheat, and why it should be something sooner cut than that grain, because the smaller the vessels are in the stem, the sooner they will be dried up, and incapable of conveying nourishment to the ear.

There is also a particular reason of cutting barley unripe, from the service it is in great part intended for, which is the making of malt. This process depends in a great measure on soaking the corn in water, for the swelling of the starchy part. All corn, while it lies on the ground after cutting, is liable to rains and wet; and he who considers the expectation of wetting his barley afterwards, will not chuse that it should be anticipated while it lies upon the ground.

This is a reason for cutting this kind of corn before it is ripe. For if wet happens while it lies in that state, the damage will be little. It is the wet lying upon the ripe grain alone, which can occasion the damage.

Barley cut at the exact time when the stalk is beginning to harden, will swell and grow perfect in the ear, as it lies on the ground, and after that will gradually dry and harden without diminishing: the contrary of this I have seen very plain, in barley which has been let to stand till full ripe, especially when there has been any considerable quantity of rain a little before. The grain, which in this case had been suddenly swelled, and was now hardened in some measure in the ear, has shrunk in bulk in a very surprising manner. What has been said of wheat, with respect to the season of the year, holds full as well of barley, namely, that in a dry summer it will require to be cut sooner than in a wet one. The whole depends upon this single principle, that the root is of no use when its extrem fibres decay, which they always do before the perfect ripening of the seed; and at that time when they have first lost their office, there remains yet in the stalk a power of receiving nourishment from the moisture of the air. This should by all means be allowed for the full swelling and ripening of the grain, and there is no way to give the plant that benefit, but by cutting it at that exact time when the root has done supplying it with nourishment, and the stalk is yet in a condition to renew this supply, and to convey it up to the ear.

The true method of finding this condition of the plant, is by examining the stalk; for when the fibres of the root begin to decay, that grows less juicy than before. It is still in a condition to receive nourishment, and to send it to the ear, though the root does not supply it; the air has enough of this nourishment, but it cannot be received by the stalk in the needful quantity, unless that be cut off from the root. But in this case the whole process is performed properly and usefully.

We see the stalks of bulbous rooted flowers being cut from the root, and set in water, will keep the plant alive a great while. The stalks of corn are in the same manner qualified to receive nourishment from the air, and to send it up to the grain. It is but for a limited time they can do this; but taking the advantage when it is required, this is sufficient; and after they have thus fed the grain, it dries and hardens



hardens leisurely, without that disadvantageous shrinking which we have mentioned, as happening too often in corn cut when full ripe. A poor thin crop of barley should be cut earlier than one which is fuller and richer, for in these poor crops, the roots decay sooner, and the grains therefore ripen the less perfectly. The observation we have made, that in dry soils the roots decay sooner than in moist, gives the reason of this; for in thin growths the sun-beams find free passage between the stems, and they parch and burn up the roots much sooner than in fields where the stalks defend one another, and the ground is kept moist between them, by the shade they give to each other. In these crops the straw dries very soon, if left to the full growth of the ear; and the mowers can scarce perform their office, because of its weakness. In this case also the grain can only shrink in the ear, as it lies afterwards upon the ground, for the vessels of the stalk are faded, which should have given it the needful supply.

#### CHAP. IV.

##### *Of the best time of cutting field peas.*

THE doctrine here advanced, of plants receiving a certain portion of nourishment from the stalk, when the root is no longer in a condition to supply it, is verified in the pulse kind, as well as in corn: and the practice deduced therefrom should be observed as regularly.

All these are annuals as well as barley; and when the seed ripens, the root decays. This is the course of nature; but in cultivated ground, where the soil is light, it withers sooner. In the common course of things, the surface of the earth about a plant in the fields is hard, and this defends the fibres of the root from the sun, as long as is necessary for the perfecting of the seeds: this is the course of nature, and when we vary from it by culture, we should provide accordingly. The opener a soil is, the easier the sun gets admission into the surface, and the sooner the roots, which have nearly performed their office, decay. We see that the stalk when fresh cut will, for some time, supply the place of the root at this period; therefore in the pulse kind, as well as the corn, we should take that opportunity of cutting the crop.

When the beans or peas intended for keeping have acquired their full growth in the pods, and before they begin to harden, is the exact time that the plants should be cut up. The consequence of this is giving them a supply, which they would not have had from nature, for the roots could not have given it; and they will thus be larger and more plump, and will dry more sound, and keep their colour much better.

This last is an article of consequence in all the pulse kind, but especially in that pea, called the blue pea; this will turn black, if suffered to stand till over ripe upon the ground; but if it be cut as soon as of a due size in the pods, the peas will swell, and fill properly in lying, and will preserve their colour afterwards in keeping.

#### CHAP. V.

##### *Of the various mixtures of natural earth.*

WE have observed, that pure mould or mellow earth is the great article in the richness of soils; and that all the good kinds partake more or less of it; to the characters already given of this, may be added its smell, which is one of the most agreeable that can be conceived: we should accustom ourselves to distinguish this, and know regularly what it is that we may, from its prevalence or weakness in a soil, know what is to be expected from it.

There is much more in this than is usually imagined; the qualities of this pure earth are greater and more essential than are commonly supposed, and it is this, or the particles of this separated by the roots of plants, from the other mixtures wherein they have been lodged, that Mr. Tull and his followers mean, when they speak of earth as the nourishment of plants.

That this fine and pure mould has a smell, all know who are accustomed to husbandry; and the physicians of older time, who sought more natural and more effectual remedies than chemistry now furnishes, were acquainted with it. They ordered their patients, in many cases, to follow the plow in dry and rich soils; and cures were performed by the breath of their common mother.

The plowman knows this difference between good and bad ground still: he is well acquainted with this scent, and when he enters on a field at day-break, can tell from the vapour of the ground, while he turns it up, yet moist with dew, whether his master may or may not expect a plentiful harvest.

Whatever it be that occasions this smell to arise from the fine pure mould, wet always favours our perception of it. The same earth which cheers the plowman at early morning with its healthy odour, has little scent when he turns it dry at noon; and at any time, a shower of rain discloses the smell to the traveller. In the garden it is not to be sought, for dung has there defiled the pure state of the earth, and sends up its own rank vapour in its place. It is for this reason the field produce, in roots and plants for the table, so much exceeds in sweetness that of the same kinds from the garden. We find that wet sends up the smell of this pure soil, in the same manner it expands its nourishing parts among the roots of plants; and if dung be in the soil, those vapours go with the rest.

It is plain from experience, that tillage will in a great part supply the place and use of that coarse addition. And there are other manures, when some addition of this kind is necessary, which will answer the same purpose, without the offensive qualities. To know these, and the soil itself, is the only means to apply them properly; and to what we have already delivered on that head, we have something to add from the result of the observations and experiments of others made since that time; and from our own experience.

#### CHAP. VI.

##### *Of the effect of water upon various soils.*

UPON this principle of water occasioning the mould to send up its lively and refreshing smell, we can understand properly the effect of rains, in the nourishment of plants; and of artificial waterings. Water alone, we find, will supply some plants with nourishment; but it is by its power upon this tender and fine mould, that it shews the great effect. It is but a few that will be supplied by water only; but this quality by which water renders mould more fit for nourishment of plants, is universal.

How it does this is not difficult to be known; and upon this will depend a great deal of the proper management of ground. The parts of mould remains entire and unseparated, so long as it is dry; and though the sun and air reduce it to the finest dust, yet every particle of that dust is so much compact mould, whose principles or constituent parts, as chemists call them, are unseparated: it is therefore dust is void of smell, so long as it continues dry: but as soon as a shower of rain falls, the very roads, much more the fields, send up a most refreshing odour. Therefore water can occasion mould to disclose its hidden qualities. This is done by separating the particles; and this also puts the mould in a state of giving nourishment and life to plants.

This principle being established, let us pursue our observation and experience farther, for there is no way else of arriving at true and practical knowledge. If we go over two different fields after a shower of rain, the one of which has been well tilled, the other more neglected, we shall perceive that the more the ground has been cultivated, supposing the soil equal, the fresher and the better it smells. We learnt by our first observation, that rain disunited the principles of mould, and thereby made it fit for the nourishment of plants; and we now learn, that the finest mould, that is, such as is most mellowed and broke by tillage, receives this influence the most readily. This is very conformable to reason; for the wet must have much more power on the particles where they are thus separated by often breaking the soil, than when they are united together into a compact body. The greatest proof of this is the smell rising from the dust of roads after rain: this consists of very barren matter, but it is broke to fine powder, and therefore the wet immediately affects it; and takes more effect on it, than it does on a better soil, which is most compact in its nature, and has not been divided by tillage.

After this examination, which shews in the strongest light the condition of soils in their natural state, as more or less influenced by tillage; let us advance to the consideration of them, as improved by manures.

Mr. Tull has said, and the generality of later writers have adopted it from him, that the effect of manures is the same with that of tillage; and that this consists in breaking the earth into small particles. Manures do this by fermentation: tillage does it by actual labour. This system, which is very rational in itself, agrees perfectly with the doctrine here established: for as there is the greatest benefit from rain, where the soil is most divided, the fertility depending, in a great measure, on that, must also be in proportion influenced by the other.

Let us next examine, after a shower of rain, two fields of the same kind of soil, one of which has been well manured, and the other not. We shall find the same difference



rence that we perceived in the neglected and the cultivated ground. Both fields will send up a refreshing smell, for all earth does this after rain; but the field which has been manured will smell vastly stronger, than that which has not.

Dung is the occasion of a particular exception in this place: the smell from a field where this has been the manure, is stronger than from any, though not so sweet. The other manures in general break the mould, without impregnating it with their flavours; dung breaks it as much as any, but its own strong scent rises with it, and overpowers that of the soil.

There are others of the coarse kind, liable to the same objection; but the principle is the same in all: and this strong smell of the manure after rain, ought to be an objection to the use of those substances which give it.

We find that all manures render the earth more easy to be influenced by rain; and this is their use; for it is the influence of rain upon the mould which nourishes plants. Those manures, which at the same time send up a coarse and unpleasant smell of their own, with the pure fragrance of the natural earth, give also the same ill-flavoured particles to the plants they nourish. From this we are taught that the most genuine and wholesome vegetables are produced on land improved by tillage only; and this is one great recommendation of the horsehoeing husbandry: and we may learn also, that when manures are used, the best and fittest for the purpose are those which have no smell or taste of their own. Thus the improving land by additions of the earthy kind, is more wholesome, as well as more lasting than by dung. The air never fails to excite some degree of fermentation in a rich soil, when it is turned up; and this is much increased by the addition of water. The ingenious Dr. Home has observed, that a quantity of pure mould, dug up and exposed to the air, swells immediately so, that the hole whence it came will not hold it: and this swelling is increased by a moderate quantity of wet. This is a separation of the parts of the soil, and this disposes it to nourish plants. Whatever can effect this, gives fertility to soil; and that which effects it most perfectly, and with the least alteration of the qualities of the soil, answers best the purpose of agriculture.

#### C H A P. VII.

##### *Of the nature of black mould.*

**E**ARTH of this kind is far from the nature or condition of what the chemists call by that name. They mean a substance from which all volatile parts have been taken away, but were that the case with this earth, it could not smell with rain. We know that odours depend on volatile particles; and we shall find, by experiments, that this earth contains such.

Authors speak of salts, but this is a questionable doctrine: the first quality of salt is, that it dissolves in water; now mould, being exposed to continual rains, would be divested of its salt soon, if it originally possessed any.

But that this earth contains oily particles, is plain from reason and experience; and these, as they are happily calculated for the supply and nourishment of plants, have also the power of scent. Water may pass through the soil for ever, and not dislodge these particles, for oil does not mix with water. We wonder how plants obtain their different qualities and virtues from the same mould, which we think does not in itself contain any thing of that nature; but this, though a natural, is too hasty a conclusion. Bodies contain things often, of which they give no testimony to the senses, and it is thus with mould. We can discover oil in it by certain experiments, though we do not perceive it immediately by the eye; and this may effect what gives us so much wonder.

Nitre will melt without taking fire, unless something of an oily nature be added to it: any oily matter will, in this state, make it flame, and nothing except an oily matter will; therefore we know that whatever takes this effect is oily, or that it contains an oily matter. Vegetable mould taken up where there has been no dung, will make nitre flame and burn violently. By this we know that it contains an oily matter in large quantity, though it be so blended with the rest of its substance, as not to be obvious to our senses. The loose quality of this pure mould, gives free passage to the roots of plants; its ready separation by water, and the effects of that mixture, tend to give its oily and other active parts to plants; and its open texture and dark colour dispose it to receive and retain all the sun beams, as they make it reflect fewer than any other surface or colour. Even light which is thus plentifully absorbed by this kind of soil, is no mean agent in vegetation, though the powers of it are but newly discovered in this part of the system. That which can put the parts of plants into a

tremulous motion and retain them in it, is no small agent in the distribution of their juices: that which has power to cause the amazing properties of the sensitive plant, may very well be received as a powerful efficient in the nourishment of seeds and other useful parts of plants.

We see a pure, loose, dark coloured mould is the kind of soil most suited in its nature to these purposes; therefore we learn that in all our management of unfavourable soils, this is the condition toward which we are to attempt to bring them.

It has been supposed that this kind of soil contained an alkaline salt, because experiments shew, that it will ferment with a weak acid, and take off the acidity. But this is an equivocal trial, for chalk and other such earths will ferment with vinegar, and destroy its acidity; and these substances are much more naturally to be expected in the earth, than absolute salts.

Chymical distillations of earth afford other substances, but many requisites must concur in order to our forming a rational conjecture of the real contents of mould from this process. It is hard to say, where mould has not been impregnated with the dung or urine, or perspiration of larger animals, or the corrupted bodies of insects, either of which may afford the things which the experimenter supposes to rise from the earth itself.

#### C H A P. VIII.

##### *Of the nature of clay.*

**I**F we examine clay according to the qualities which we have found to be essential to the nature of a good soil, and to give that character to mould, we shall find it has them not. It does not readily receive water, nor break and come to pieces with it; nor do we perceive when it is wetted with rain, that fresh smell which rises from good mould. It will not ferment with acids, nor alter their natural taste, nor has it the common properties of the other earths.

There is no oil apparent in it, but its qualities render it very probable, that there is in it a large portion. Its soft toughness is like an effect of oil; and the way in which water runs off from it, is also very like the nature of oil, which does not admit water to mix with it on any occasion.

Experiments fail in separating this, but that is no proof it is not in the substance; for things may be so united by nature, as to be very difficultly separated by art. What is most singular in the chymical experiments made on clay, is that it affords a small quantity of an alkaline spirit. This contradicts the account given by chemists of earlier time, who say, there is in it a vitriolick acid: but perhaps it may not be difficult to account for this mistake. We find in all the clay pits about London, and in general throughout the kingdom, lumps of the mineral called pyrites, from which copperas is made; this contains abundance of vitriolick acid; and perhaps this has led the chemists to suppose that acid was in the clay itself.

It is of use to know thus certainly and exactly the principles and constituent parts of soils; because we shall that way be led rationally to the use of proper additions in the article of manures. Practice and experience are the farmer's best guides, but these do not exclude a deeper search: the best use of experience is to select among many things, that which has answered best; but there is need of a fund of knowledge, to know which substances should be brought into the trial.

The oil in clay is so latent, that a lump of common clay put into melted nitre, would not make it burn; but being powdered and thrown in, some sparks were occasioned. We have these experiments on the authority of Dr. Home, whose veracity is as much above impeachment as his knowledge.

#### C H A P. IX.

##### *Of new manures for a sandy soil.*

**T**HE addition of clay to sand, which reduces it into a perfect loam, is well known, and has been practised with the greatest success; and even where the sandy soils are poorest of all, there needs only to be some pasture earth thrown on with the clay, and the whole becomes a good and valuable mould. But since the publication of these methods, a new practice has been introduced, and that very successfully in some parts of England; this is the manuring sandy ground with boggy earth, or that light and tough soil which lies in boggy ground at some distance below the surface, and approaches to the nature of peat.

The experiments which have been made with this, have succeeded



succeeded variously in degree, according to the skill with which they were made; but the best method is this.

Dig from the wet part of a bog a quantity of this light, spongy, wet soil; and while it is moist and tender, mix with it some dry pasture earth, and a small quantity of coal ashes. Blend all well together, and spread it over the field.

Ploughing comes easy on this kind of land, therefore let it be well plowed in, and after sowing, sprinkle on some old woollen rags chopped small. This is not a very dear way of dressing, the land it is meant to improve is cheap, and very often it succeeds so well, as to set it upon an equal footing with the better kinds. The effects of the bog earth is lasting, that of the rags is temporary, and should be renewed after every crop.

The author to whom I believe the first hint of this practice was owing, speaks of using the boggy earth alone, but where I have seen that tried it did not succeed. Indeed, used alone, it is inferior to clay; because, though it has the same quality in detaining wet, which a sandy soil naturally suffers to pass off too quickly, it has not that fund of fertility which we find in clay, but this way it answers excellently.

Rags are also recommended alone in sandy soils, but they cannot supply the great want of vegetable mould, or something analogous to it. Neither is it practicable to get the rags in quantity enough, to be used as a manure of any consequence alone, upon large pieces of sandy soil. Nothing is more wanted than a substance which would answer this purpose, for the quantity of sandy ground almost barren, is very great in England; and what we here propose promises to answer fully the purpose.

#### C H A P. X.

##### *Of the management of a heathy soil.*

**B**Y a heathy soil we mean that kind which is usually found on heathy and dry barren ground: the Scotch have a peculiar name for this soil, they call it *TILL*, tho' it seems their farmers, who are as confused in their names of things as ours in England, sometimes give the same name to other soils, only because they are barren.

He who recollects the brown dusty matter, which forms the upper coat of the ground on our large hilly commons, where no turf covers it, and where fern, and heath, and furze, and a few brambles make up all the growth, will know what is meant by the heathy soil: but for its qualities and nature we are indebted to the discoveries of that excellent person before named, who has applied science to the service of agriculture.

He discovered that in these soils, there not only is wanting the fine mould, which is the proper food of vegetables; but that they contain a kind of poison to all vegetable life: and by trials of the chemical kind he found this poisonous quality to be owing to particles of iron.

The experiments by which this was made are incontestible. An acid would ferment with it, and acquire by that means an irony taste: this liquor would turn black with galls: and the soil itself, when calcined, would be in a great measure attracted by a loadstone. These are the proofs of iron in the soil; and the qualities of that metal were shewn by as plain experiments: a small quantity of salt of iron dissolved in water, and mixed with vegetable mould, destroyed the plants which were sown in it.

Thus we learn the two great qualities of the heathy soil; and by knowing truly to what the barrenness so peculiar to it is owing, we are directed in what manner to attempt the cure.

Though it be evident from the experiments of Dr. Home, that an irony matter in this quantity, is a poison to plants, the farmer needs not despair of mending it: nor is he to suppose, that in order to this, he must get out the iron it contains. Plants, though destroyed by too much of this ferruginous matter, will plainly bear some portion of it. For Geoffroy and Lemery among the French, and many since among ourselves, have found that all plants contain some iron: the ashes of all vegetables, so far as has yet been tried, contain some particles which are attracted by the loadstone. It is not necessary therefore, either to take this iron out of the ground, or to render it incapable of dissolution in water, so as to be carried up into the vessels of plants, as has been thought needful for this purpose; the great point is to add a due quantity of matter, which is fit for vegetation, to this dry and ferruginous substance which is not: and nothing is equal to pond mud. This must not be used alone, for it would wash away from the soil, but with a mixture of a clayey loam, it makes a manure that will remain with it, and improve it in a lasting manner.

There is so much of this heathy land in England, that it is a thing of great importance to amend it: and very late experiments have proved, that this, though it be difficult, is not impracticable. If we could take out the irony matter from this soil, that alone would not be sufficient; for it would still be in the condition of a dry loose dust, incapable of detaining the rains, and wholly destitute of the common nourishment of plants. Therefore, as this taking out the ferruginous parts is neither practicable in itself, nor would it answer the purpose if it could be done; the method that is to be attempted is very plain: good vegetable matter must be added in large quantity, so that the irony particles, which now in a manner make up the soil itself, shall be but an inconsiderable part of it; and this must be of such a kind, that it will remain in the land, and will detain water sufficiently among it.

For this purpose let the practical farmer mix equal parts of pond mud and of a tough loam; that is, of an earth which consists principally of yellow clay, but has so much sand in it as will render it capable of mixing with the mud. There need be but a small mixture of it for this purpose, because the heathy soil itself being loose and hard, will assist in the union.

When the mud and loam are mixed, let the shrubs and fern, which grow upon the land, be torn up carefully by the roots, and carried off the ground, and burnt to ashes; let these ashes be mixed with the mud and loam, and the whole spread over the ground and plowed in. Let it, after this, be every year refreshed with a smaller quantity of the same manure, and it will become and continue a rich and fertile soil. The price of this dressing is considerable, because of the quantity; for so much must be laid on as in a manner to new make the soil. It is not to be considered or managed as the common method of laying on dung or the like manures, but as the improvement of a soil by marling: the quantity of which renders the first expence considerable; but the advantage very well answers to it, because it lasts many years.

After the soil has been thus rendered of the nature of the better kinds, it may occasionally admit all the other improvements. Four crops may very well be expected from it in the common method of husbandry; but after these it will be serviceable to sprinkle over the ground, soon after sowing, a small quantity of wood foot, and the dung of fowls mixed together, and a little rich mould added to this, to make it spread well upon the ground.

This will give the loose soil a new fermentation and warmth; and the increase in the crops, and fulness of the ear, will very well repay the additional expence.

It may not be improper to add on the present occasion, that there is scarce any thing which has such an immediate effect upon the grain in the ear, as this mixture of fowls dung, and foot. The greatest success is when this dressing is given with a light and sparing hand, near the time of the formation of the ear upon the young stalks.

#### C H A P. XI.

##### *Of the effects of laying up a soil in ridges.*

**W**HETHER we have a soil to improve which has in itself the qualities necessary for a fruitful vegetation; or, whether it be one that has received the assistance of manures; nothing tends more to the improving its qualities, or bringing into action its natural or additional richness, than the exposing it carefully to the air.

It is seen by repeated experience, that when a soil, which is in itself good, has been exhausted by repeated crops; the turning it up to the air, for a due time, recruits it.

This is the effect of fallowing of land: but we have not the full advantage that might be obtained from that practice; because it is not done in the most judicious manner.

This is a consideration of great importance to the farmer, who is often obliged to depend upon fallowing, because he has not dung: it is only in the neighbourhood of great towns, this can be had in abundance; and many of the best manures beside depend upon the same accident. The very richest kinds are supplied almost entirely from London: and it is in a great measure owing to this that the Hertfordshire farmers, and others who are within reach of the metropolis, have better crops than the rest. What is attributed to their management, is in a great measure owing to their having the materials in abundance, which are necessary to produce them; shavings of horn, shreds of leather, rabbit clippings, and the like, cannot be had in sufficient quantities elsewhere; nor are rags and coal foot to be obtained in due quantities in the country.



To these advantages the farmers of the neighbouring counties owe in a great measure their success: and those who live where such artificial assistances are not to be obtained, should carefully make the most of the natural benefits.

The air is common to all places, and it is the great repository of vegetable nourishment. Into this are evaporated the virtues of dung and soot, of putrified animal and vegetable substances, and of whatever else is known, and doubtless of many things which do, they are not known to promote vegetation.

These things have come originally from the earth into the air; and they are capable of giving vigour to the farmer's crops, if added to the earth again.

They come best when mixed with dews and rains, because then they are better blended with the mould, and will remain longer in it. Therefore, the farmer's business, who places his dependance on these, is to put his land into a condition to receive them.

Tillage gives land this quality. The air, impregnated with every kind of fertility, may pass for ever over a piece of ground, the surface of which is hardened and smooth without doing it the least service; but when the parts are broken and the surface is rendered loose, these enriching particles enter and remain.

To this is owing the benefit of plowing fallowed lands. If they were left vacant of crops only, they would recruit themselves very little; and in consequence, the more they are plowed the greater is the advantage.

The farmers think this arises from the destruction of weeds, which would otherwise grow large upon the ground, and exhaust it; and Mr. Tull, who has often happily, though not always exactly, applied philosophy to tillage, supposes it to be owing merely to the breaking and dividing the particles of the soil.

The truth is this, weeds would exhaust but little; but the soil would also gain little, if left so quiet as to admit their growth upon it: and in the same manner we may say of tillage, that it does not in itself give that fertility to the ground, but it puts the mould into a condition to receive it. On this let the farmer count, and he will not be disappointed: and understanding what it is that gives him this advantage, let him pursue the course by which he will obtain it the most perfectly.

The oftener the ground is plowed during the time of its lying fallow, the more advantage it will receive. In this manner he may give it in four months as much fertility as it usually receives in eight; and by a proper method of exposure, he may obtain much more than twice the usual advantage.

Since it is by exposing the soil, in a new broken condition, to the air, that the great advantage of fallow is to be obtained; the more it is broken and the more perfectly it is exposed, the greater in proportion will be the advantages.

Therefore, let him allow more plowing and deeper than is common for fallowed lands; and let him turn up the soil in higher ridges.

Experience shews, that the banks of sheep-folds, though they have scarce any thing of the advantage of the dung and urine of the creatures, yet are rendered so extremely fertile, that they serve as a manure for other lands. It is not to be questioned, but they receive some benefit from the effluvia of the creatures, but the great advantage is from the mould of which they consist, being exposed so openly to the air in a high ridge, and with but little thickness.

Something of the same nature we may learn from the common condition of ditch-banks about London, which are fertile in a surprising degree of weeds, though they are made up of the very worst part of the soil; nothing being employed for that purpose but the digging of the ditches, which being carried down two or three foot below the surface, generally afford not vegetable mould for the most part, but a loam or brick earth. This is not fertile in itself, and it can possibly have no advantage but from being thus exposed; and yet the consequence is even a surprising fertility. There cannot be a greater proof of the absolute effect of the air upon land, when properly exposed to its influence.

We do not expect the farmer to lay up a whole field that he fallows, in banks like these: but as he sees the greatest advantage is to be obtained by throwing up the soil in high and narrow ridges; let him in all his plowings of fallow land, understand that the higher he throws up the ridges, the more benefit the earth will receive from the air; and that the next article of improvement under this circumstance, is the frequent repetition of the work. It will

be worth some additional trouble to obtain so much larger advantage; and by due attention to this care, the want of manures will, in many soils, be scarce perceived. The means of the benefit are the rains and dews; and those who fancy these to be plain water and nothing more, are vastly mistaken. Dews are raised from the earth, and from all things which contain a moisture, that the warmth of the air can exhale; the perspiration of plants is now well known, and that of animals is an everlasting supply: both these come into the air and mix with dew, and therefore it is capable of giving vast fertility to land. Rain water has, in some degree, the same advantages, for it has been raised in vapours; and howsoever pure it may be supposed by those unaccustomed to minute researches, the chymist knows it contains particles of many kinds, beside the water. These two kinds of moisture, when they fall upon a hardened surface, do not penetrate, and when upon a soil that is naturally loose, they run through. It is the ground mellowed by culture, which receives their true benefit. In that the particles are separated enough from one another to give passage to the water, and they are so loose on their own surfaces, that it is also admitted into them as well as between them; and in consequence of this it mellows and ferments the soil more and more.

The earth in which plants are to grow, consists of innumerable such particles, and the more of them are thus impregnated, the better it will produce.

As this fecundity is owing to the air, it will be obtained only in those parts of a field thus prepared to receive it, as are exposed to the air. We do not mean by this, that the air, rains, and dews affect in this manner only the surface of the earth: they really penetrate in this effectual manner to some depth; and the superficial part so far is enriched; but no deeper: therefore in order to give a land the full advantage of fallowing, or in other words, to enrich it as much as possible by rains, dews, and air, it must be often and thoroughly turned.

We will suppose a field laid up in high ridges, as has been here directed, and thus impregnated with all the virtues of the air. When it has lain long enough for this advantage, the period of which must be varied, according to the season and weather, these ridges must be all broke down, and new ones thrown up in such a manner, that the part of the soil which was before in the middle of those ridges, and was therefore hidden from the air, shall be now the outside of the new ones, and consequently shall be fully exposed to it.

This process is to be repeated, till the whole soil has at one time or other been turned open and free to the air, and has lain exposed to it as long as was needful, for obtaining this fertility.

The husbandman needs not to fear, that while he is giving this advantage to one part of the mould, he is losing it in another; or that the part which was enriched by being exposed to the air, will lose that quality again, by being buried: the fecundity the mould thus receives, is too substantial for such loss. It will never evaporate, nor any way be lost, but in the nourishment of plants. Let him take care he does not permit weeds to grow upon the place to exhaust it; and it will remain to enrich his crop.

Fallowing has this other advantage for the farmer, that it is best done when the ground may be left at rest without loss. In summer, which is the time for his annual crop, it would receive least benefit, because those particles which should be received into, and detained in the soil, are then in a great measure dissipated in the air: it is in winter, and in spring, the great benefit of fallowing is to be obtained; and he who has not tried the rational practice here laid down, cannot conceive what may be done by mere fallows, between the time of gathering in a crop in autumn, and the season of sowing another in spring.

They err who advise tillage in the place of manure, or would have the farmer depend upon manure, without due tillage; the true method is to make a judicious use of both: and in the case we have named, all should be left to the effects of fallowing, till the seed is in the ground, and then a light sprinkling of some of those rich manures, which operate in a small quantity, is of prodigious advantage. The soil is loose and open, so that it is readily received, and penetrates deep. It is a season when rains are to be expected, and they wash it in; and this is done just as the seed is swelling and softening in the ground, and as the new roots are shooting from it: the most perfect virtue of the manure is received into the first rudiment of the plant, and the original shoot being strong, the whole succeeding growth will be strong also. The soil is free as well as rich, and the fibres of the roots are sent every way, and wherever they disperse themselves, they are lodged among nourishment.



## C H A P. XII.

*Of the effect of the winter season upon vegetable mould.*

WE have observed that the winter and spring are the seasons wherein the earth receives most benefit from fallows, and the fact has been acknowledged by those who differed most as to its cause: it has been a custom to talk of nitre in the air, as a great efficient in fertilizing the ground; and the winter air has been supposed to abound with this useful salt, more than that of summer: frosts have been attributed to it; and consequently, that fruitful quality which the earth is found to receive from a winter exposure to the air, has been attributed in a great measure to it. But we may find more natural causes; and it is necessary we should understand the true ones, in order to take advantage of them, by managing our culture of the ground accordingly.

If it were true, that the air in frosty seasons thus abounded with nitre; that would be a reason why it should hurt, instead of improving the soil, for nitre in a large quantity appears to be as much a poison to plants, as iron.

Indeed frost is produced without the assistance of nitre; and it effects the good purpose of fertilizing the ground merely as frost; not as operating by means of that salt.

Whatever breaks the body of the mould, gives it the means of receiving impregnation from the air; and frost does this in a very apparent manner. It immediately connects and combines the particles of earth by means of the water that is among them; and when it ceases, they separate and moulder away from one another. This exposes them to the air with new surfaces; and whatever does that, obtains the advantage of a new impregnation. It is for this reason frosts, which immediately follow rain, do most good to the soil; and the farmer, who knows this, should take the advantage in its full extent, by plowing up his fallows at those seasons when rains and succeeding frosts may be most naturally expected.

Snow has been by many supposed to fertilize the ground, on the same principles; but it is an equal error. That snow has this effect is evident; every plowman, as well as every gardener, knows it; and these untaught observers reason better when they say, that snow mellows the ground by lying upon it, than the philosopher who has recourse to his nitrous salt, or the chemist with his nitro-aerial principles. Of late a new system of the fertility derived from snow is established; and as there is some mistake in it, we are sorry to say it is the thought of Dr. Home, who is in other particulars so just a reasoner.

The system is, that snow contains an oil, and by that means gives fertility to the earth. The proof is, that snow water being set a fortnight in a cellar, became covered with a mouldiness, and that this mouldiness burnt on a red hot iron: we shall not deny that mouldiness contains oil; all vegetables do so, and mouldiness is of that tribe. But this oil neither ever was in the snow, nor is dependant on it.

We have of late time arrived at a great degree of knowledge in the minute part of the creation: mouldiness is known to consist of small plants, whose seeds floating in the air, take root on the surface of fluids. This is all: these small plants would have contained their portions of oil, whether they had grown on snow water, or on common water; and the snow would have afforded no oil without them.

The same accurate examiner allows that snow contains no salt; and we are therefore left to the plain old system, of its mellowing the ground; and its moistening it in a peculiar gradual way, by its slow melting, for the effect it has in fertilizing the soil.

## C H A P. XIII.

*Of the overflowings of lands.*

THE farmer dreads his land being overflowed at an improper season; but when he can obtain it at a right time, there is nothing he ought more to wish. We speak here of the plain and simple overflowings of a common water loaded with light and fine particles of mould, such as floods naturally bring with them: but there are waters whose quality is as hurtful as this can be beneficial.

When violent rains, running from a somewhat higher country into rivers swell them beyond their banks, and the lands upon a level, a little above their natural surface, are overflowed, there is the natural addition of a most rich and excellent manure, and it is spread in a manner art could not effect.

These rains wash out of the plowed lands of the higher country the richest part of the manures, and the lightest and

finest of the soil. They run thick with these into the rivers, and they are in the same condition carried over their banks to the adjoining grounds: thus the richest part of dressings, mixt with the most valuable portion of the natural earth, is spread in a thin coat over the surface of the ground. The flood remains long enough for the thick parts in the water to subside, and the abundant wet is thoroughly discharged, either by the natural descent of the ground, or with the assistance of a few drains; and all is left that could be wished, and nothing beside.

## C H A P. XIV.

*Of waters hurtful to vegetation.*

SUCH is the effect of those favourable overflowings; but where water impregnated with ingredients which are enemies to vegetation, or even with those which in a small proportion would help it, in an over abundant degree, the damage is as great as the benefit in the other case: and when the impregnation of the water is extremely strong, often it exceeds in mischief all the other could effect of good.

The farmer sees what he should seek in overflowings: we shall now tell him what he is to avoid. A warm muddy water is what he should desire, and on the contrary, such as is clear and cold will do great damage. The water of rivers in flood is the best, and the water of a cold spring in its clear, pure state, can do nothing but mischief.

Even if it should come over the ground when the crop wanted watering, it would not answer that purpose without greater mischief; gardeners know the water given to plants should be of the same temperature with the soil on which it is sprinkled. If it be cold, it does more harm by chilling the roots, than good by affording moisture. A field is only a great garden; and he will manage it best who best understands the garden culture.

Beside the hardness and coldness thus found in absolute water, there may be much worse ingredients. Springs are medicinally impregnated with salts and metals; and in this case their water is very improper for the service of vegetation. When this is the case in a great degree, the waters are reserved for useful purposes; but it very often happens, that springs are impregnated with these in a lighter manner: it is not perceived or regarded in the taste; but it may be enough to hurt vegetation.

In these cases, where a spring rises on the land of a farmer, his great care must be to conduct it off; and where it runs elsewhere near him, he must prevent its getting into his ground.

We have shewn that iron is hurtful to vegetation, when the quantity is abundant in the ground; and iron waters are in England very common. The husbandman cannot be too much upon his guard against these. Springs are often so situated as to influence the ground to a great distance: without making bogs, they will from like causes moisten the coat of vegetable mould a great way, and so far as their influence extends, no manure or other art can produce good crops.

When the farmer suspects this, let him try the water with galls, or even with green tea: the method is easy, and the proof is absolute. If the liquor become purple or black, there is iron in the water. And till he has dug a free passage for it below the level of the coat of mould, he must expect no fertility in the ground.

Salt springs have the same quality: for though a little sea salt or sea water are excellent as manures, too large a quantity is always destructive to vegetation.

Waters impregnated with the principles of sulphur, are also hurtful, in a great degree, to vegetation; and when it happens that veins of coal are so disposed, that water can be impregnated by them, and afterwards can run upon the farmer's land, the damage is equal to that arising from any of the other.

These observations respect particular cases, but they may be extremely useful: there are ferrugineous springs common on high lands; and in their course they are often detained by the particular construction of the ground, where they do great and unseen mischief. Many a piece of land in this kingdom, which has been neglected by the common farmers, and has foiled the attempts of the most artful in the common methods, may be rendered as good as any in the neighbouring country by digging a single drain to carry off those poisonous waters.



## CHAP. XV.

*Of earths hurtful to vegetation.*

WE enter here on a new article in husbandry, but it is of the highest importance to the farmer in many particular instances: as there are waters hurtful to the growth of plants, so there are earthy and other solid substances found in digging, which are hurtful for the same reason, and at least in an equal degree.

This depends on a plain cause, for earths and other such substances may be, and are often impregnated as strongly with these qualities as water.

The farmer is in many cases advised to use clay as a manure upon his sandy lands. Let him take care that he use for this purpose the white, yellow, or brown clay, avoiding the blue and black, unless necessity urges him to take them; and then never meddling with them except he has first carefully examined them.

All the blue clay about London is full of lumps of pyrites of shells filled with this substance, of pieces of wood whose pores are filled with it; and of glittering, loose, little particles of it.

This would be most unfit to lay upon land as a manure. We have found that iron and sulphur are poison to plants, and this pyrites is composed of these two substances. The farmer will know it by its shining, and wherever he finds it, he must be careful to keep it out of his ground.

Even in the other coloured clays, which are commonly used for this purpose, lumps of this matter are often found; and there cannot be too much care used in picking them out of such as is intended for manure.

It is the quality of these lumps of the pyrites, that they will lie buried in the earth ever so long without breaking, or dissolving; but when they are exposed to the air, they in a few months crack and fall to powder; this powder tastes like copperas, and is indeed full of that iron salt. The rains dissolve this, and its influence is spread as far as that moisture reaches.

Not far from Thorndon in Essex, the seat of the late excellent Lord Petre, I saw a field of corn in general in good condition; but here and there were spots in which the crop was utterly withered. There were so many of these, that they greatly reduced the value of the crop. We spoke with the farmer, who contented himself with saying it was a blast: but we shewed him the cause. The field had been dressed with what he understood to be a yellow marle: it was really a loose and somewhat loamy clay; and with this had been thrown on many of these vitriolick lumps, which as they were not large, he had not been at the trouble to remove. I shewed him the remains of these in every spot where the corn was thus blasted, and on tasting the ground, he was sensible of an inky flavour. According to the bigness of the lump, this mischief had extended to two, three, or four foot diameter. The man was sensible of his error; and his loss may serve as a caution to others.

Beside clay impregnated with pyrites, and the masses of pyrites itself, there are other substances which contain iron, and may therefore be hurtful to vegetation; if they are originally in the ground, or are by any accident brought into it. Ochre is a substance very well known in England, and however valuable in itself, it may be very detrimental to the farmer if it comes upon his land where valuable crops are to grow. This also is a clayey substance highly impregnated with iron; and as it will break to pieces in the air, the influence of that pernicious mineral would extend itself over the ground.

The finest ochre is found in lumps, and discovers itself by its bright yellow colour; but we sometimes find whole beds of a coarser kind, not unlike the brightest of the yellow clays: this is impregnated with iron, though in a smaller degree; and if this should by any careless husbandman be mistaken for a common clay, and used as a manure, the consequences must be very destructive. We do not mean by this, that any earth which is impregnated with particles of iron, is thus fatal to vegetation; for all clay contains some little portion of it. The mischief depends upon its being in large quantity; and in a state of easy separation; and this is the condition of iron in the ochres, and of the vitriolick salt in the lumps of the pyrites lodged in beds of clay.

Beside these there is yet an earthy substance to be named, into the use of which the farmer may be easily deluded; and which is very destructive. It is a blackish, brittle, earthy matter, found above and between beds of coal, and sometimes in a thin stratum lying over beds of clay and of marle. There are black marles, as well as those of other colours; and the farmer may easily be led into

the mistake of using this black, brittle earth, as one of them.

This would be very mischievous in the effect, for it is an earth loaded with iron.

The mistake has been sometimes made, and the consequences has been not only the destruction of the present crop, but the debasing of the land for many years. This earth is a loose clay, full of minute and half dissolved particles of the pyrites before mentioned. When this is laid on a field by way of manure, the quantity is very great, and the whole body of the salt is washed in before the mischief is discovered. Dr. Home mentions instances of his own knowledge of pieces of ground remaining utterly barren for three years, after such an earth was laid upon them; and gives the testimony of others of its having contained the mischievous effect much longer. This sagacious examiner into the nature of these substances, found that the mischief was owing to iron; and indeed, the taste of the earth, after it has lain a little time exposed to the air, very plainly declares as much.

The husbandman will know this by its taste, and by its crumbly and rough surface; but he will be led early into a suspicion of it, by the manner in which it lies in the earth. Marle usually forms vast beds or thick strata, and there lies compact and firm, however brittle it be when taken up; whereas this poisonous substance lies only in thin loose veins upon or between beds of other matter. These marks will shew it, and they should be understood as most important directions to the husbandman, to avoid what would be more destructive than all the common accidents attending on his crops put together.

## CHAP. XVII.

*Of the construction of dunghills.*

AS mean a subject as this may appear to the generality of readers, the farmer is deeply interested in it: to him it is of more importance than almost any thing; and it is for that reason, that while we wonder at the artless method in which these heaps of manure are generally made up, we shall endeavour to give directions whereby those faults may be remedied.

The intent of a dunghill is to preserve such materials, as may be useful for manure, till they are wanted upon the ground; and to encrease their virtue by fermentation, while they lie together. What is understood by common dung, is straw wetted with the urine, and mixed with the excrement of horses. The straw, which is a vegetable stalk, becomes by degrees, a very rich part of the manure; the animal matter promoting a fermentation in it, which reduces the dry substance of it into a soft and mellow pulp, which by degrees dissolves as it were with the rains, and is washed into the ground, and becomes the food of a new plant.

In this manner all vegetables will rot, and in that state they will furnish a supply of nourishment for others. Therefore all waste matter of this kind should be mixed with the dung in these heaps, and rot among it.

We have given the method of making a pit for a compost of all refuse, in a preceding part of this work; and we shall now treat of the management of those quantities which are exposed in heaps upon the surface of the ground.

A great article in the rotting, fermentation, and due preparation of dung, is the keeping it in a middle state of moisture. Those who make pits, usually keep it too wet; and in the common method in dunghills it is too dry. The best way is to open a large but shallow pit in the ground, where the dunghill is intended to be raised, and to clay the bottom of this, unless it be in a soil which will naturally hold water: but that too much wet may not be, there should be drains from this, and the liquor running from them should be preserved. In this is contained a great deal of the virtue of the ingredients; and it should be returned to them again at proper times. When rains keep the heap moist enough, this may stand in the pit into which it runs; and in dry seasons, when the upper part of the dunghill is crumbly, it should be thrown upon the surface again at different times, by a labourer, with a scoop. By means of that repeated and gradual wetting, which would supply the place of rains in seasons where none fell, the mass would be kept at all times in a due condition of moisture. This wetting with its own liquor would be also in many respects preferable to that by rains, for the moisture itself having been tinctured with the fermented materials, would the more and better assist fermentation.

They place their dunghills much amiss, who lay them on the tops of hills, or in bottoms. In the one case, the winds dry them too much on the surface; and in the other, an over-abundance of wet chills and stops the fermentation,



as well as destroys the consistence, and washes away the best parts.

The proper method is, to fix upon a place which has a very small descent: and a little below the dunghil, to make one or more of those pits, which are to receive the moisture that drains from the mass.

When the dunghil is large, there should be several such pits, because the quantity of moisture which runs off will be considerable; and because it will be easier for the labourers to sprinkle over the whole mass from several pits in different places, than from one.

As the sun is of little service in this fermentation, it is best to allow it but little influence on the dunghil, because it will evaporate the more subtle parts. Winds have the same effect; and therefore the dunghil should no more be exposed to one of these, than to the other: having chosen the proper spot, let the farmer plant about it trees of quick growth, and such as will bear moisture: none are so proper as the poplar kind. These will shoot very quick in a soil kept moist with the impregnated water of a dunghil, and they will keep off the sun and winds: but this is not all. The poplars evaporate a vast quantity of moisture, this will hang in the air defended by their shade, and the dunghil will have the advantage of shade and warmth, and a moist air. Fermentation will therefore be promoted, and a mischievous evaporation prevented; the whole mass will mellow by degrees, and by frequent turnings will become equally and uniformly fit for vegetation. A dunghill like this will answer doubly the purpose of that which is made in the common careless manner; and the trouble is little more than is allowed in the usual way.

When we direct that the dunghill should be defended from the constant force of bleak and drying winds, we do not mean that it should be hedged round, or absolutely shut up from them. Let it be open to the south-west: for the most benefit is found from that quarter: why it is so nobody can tell, but experience shews that it is so.

Every time the dunghill has been fresh turned, let a thin covering of mould be scattered over it; the parings of any waste place near hand.

This assists in defending the dung from the mischief of evaporation; and being sprinkled over occasionally afterwards with the drainings of the dunghill, and turned in with the next digging up of the mass, it will not only encrease the quantity, but even improve the whole.

The purpose of dung is to give fertility to land; and we are sensible that it does this, by raising a fermentation. It will better raise this fermentation when there is a small quantity of mould among it, than when it is mixed pure among the soil of the field.

Those who are accustomed to fermentations, know that they are never brought on so regularly, or succeed so well, as when a part of the matter to be fermented is originally mixed with the fermenting matter. It disposes the two to mix more readily; and all the power of the ferment is preserved and employed, whereas, otherwise, a great deal of it might be lost before the operation was well begun.

This is exactly the case in the present instance; and absolute dung therefore does less service, than such as has an original mixture of mould with it.

Pure dung, though well mellowed in the heap, will be in a great measure evaporated on the ground, before its proper fermentation, by which it is to improve the soil, is begun; but when there is a mixture of mould with it, the operation begins immediately, and there is no time for the evaporation.

#### C H A P. XVIII.

##### *Of assisting the fermentation of dunghills.*

**W**E are sensible that many disagreeable substances are used by the farmers, immediately upon the ground when corn is sown; and we may much better bear the thought of them in the making of dunghills, where they alter their nature by fermentation, before they are brought to the immediate service. Thus old woollen rags, full of the effluvia of beggars who have worn them, are thrown immediately on the field where corn is growing; but there would be less coarseness, in adding such things to the common mass in dunghills.

This apology is necessary for what we are about to propose; which is assisting the fermentation of these repositories of manure, by putrifying animal carcasses.

Experiments have proved, that the degree of putrefaction and fermentation is much greater in the flesh of animal bodies, than in their excrements; and on this principle is founded the method here to be proposed, of assisting the fermentation of dunghills.

Half the effect of this manure is lost to the farmer, by the single accident of its being generally but half fermented when laid upon the ground. Perfect fermentation would mellow all the parts; and they would then and no otherwise be all useful to the purpose of vegetation. This will be promoted extremely, by adding, at a proper time, the flesh of putrifying animals. It will lose its particular nature in the general mass, and will have no particular effect upon the corn, more than a very perfect enriching of the soil.

Thus when the dunghill is made up, and has lain so long as to require its first turning, let there be buried in it, at about the third part of its depth, the carcasses of two or three dead dogs, or some other matter of like kind; and let a coat of mould be thrown over the top of the dunghill; when it is made up again with this addition, the first effect of high fermentation is over, by the time of its first turning; but the matter is by no means in a state not to require more. The effect of these buried animal substances is to excite anew this fermentation; and from their lasting putrefaction, it will continue and encrease in the very body of the mass for a long time. A month after making up the heap in this manner, let there be a good sprinkling given to the surface, with that rich liquor which has drained from the heap. This will continue the fermentation when it was beginning to flag; and this should afterwards be repeated once in a fortnight, but in a slighter manner, unless accidental rains render it unnecessary.

When upon repeating the turning the dung it is found to be mellow, and of a regular consistence throughout, it should be immediately used, where there is occasion for it: for longer keeping is to its disadvantage. There is a state wherein all things are the most perfect in their kind; and then they should be employed, for nothing continues in it long.

The manner of using the dung must be in some degree different, according to the season of the year; for the same practice that is good in winter, will be bad in summer; for at one of these seasons the dung would be receiving benefit by the air; as it lay on the ground: and of the other it would suffer extremely, by evaporation from the sun.

#### C H A P. XIX.

##### *Of the manner of laying dung upon the ground.*

**T**HE farmer who will attend to the least articles which concern his profession, will find great advantage in his profits. Things are carried on in all businesses in too mechanical a manner, and in none so much as this. When the ground is ready, the dung is carried to it whether it be fit for use or not; and the same method is used on most like occasions.

In winter dung will lose little or nothing by evaporation; and on the other hand, it will gain a great deal of advantage by lying open to the frost, snow, cold rains, and dews: and in consequence it is best to lay it on some time before the ground is to be wrought for plowing it in; on the contrary, in summer it gains little from the air, and loses a great deal by evaporation; and therefore the sooner it is covered, the better.

On this principle let the farmer conduct himself in the use of dung on plowed lands. In the cold months let him plow up the ground just before laying on the dung; and then let it lie a considerable time. The rains will wash out a part of its virtue, and this will be freely received by the new tilled land. At the same time, it will be also receiving continually new virtue from the seasons; and by degrees more and more of its substance will be washed into the soil, as more and more of it becomes capable of dissolution by the power of the air; till at length the mass is to be buried by another tillage.

On the other hand, when dung is to be laid on in hotter weather, let it be brought into the field just before the plowing; let this be done only from the time of day-break, till an hour before noon, that it may not be exposed to more sun than it need; and let it be plowed in as it is brought on. No more being thrown upon the ground, than can be wrought in that day.

#### C H A P. XX.

##### *Of more singular manures.*

**W**E learn from repeated experience, that all vegetable and animal substances, when they come to a state of decay, serve for fertilizing the ground: but though these are a very numerous class of bodies, they are not all that may be called in to the assistance of the farmer. Salts, which are of mineral origin, and various other substances,



have been tried; and the result of these experiments cannot be made known too universally.

Virgin earth, that is, such as has had no growth upon it, not only is very fertile in itself, but it will give fertility to other ground: the more, if it have stood for a considerable time exposed to the air.

Thus a bank of common mould, which has stood a year or more exposed east and west, will contain so much vegetative matter, that it will act as a manure upon twenty times its quantity of common soil.

This is a kind of manure which farmers should seek after more diligently than they do: it is often to be had where it is perfectly neglected; and might be obtained in any quantity at pleasure. It fertilizes the soil without giving any rankness to the growth; and is, perhaps, of all others, the manure best adapted to pasturage.

Acid liquors promote vegetation, if not too strongly so; even the corrosive kinds, when diluted with a sufficient quantity of water, have this effect. We have instances not far from London, where corrosive acid liquors are made, and where the refuse and waste matter is thrown about at some distance: I have observed the consequences, and find constantly that where the quantity is great, every thing is burnt up by it; but where less is thrown, the plants which nature has scattered over the ground, thrive in a most surprising manner.

I have observed also, that when a quantity has been thrown out, that would have done mischief to the plants in a natural state, rains having come on, it has been rendered beneficial.

This is a thing worth careful notice. The quantity of acid liquors made in London for the use of dyers, and the workers in metals, is very great; and the refuse of these is a manure of the more consequence, because a very little of it goes a great way.

There are many natural reasons why this effect should be produced by these substances. We know the earth abounds with alkaline principles; on these acids work, occasioning first a fermentation, the use of which to vegetation is very well known, and afterwards producing a neutral salt. The benefits of this are enough known also.

But beside all this, these liquors give absolute warmth to the ground. We know that any of these acids being mixed with common water, produces heat: water is never wanting in the ground, and consequently there must be a proportional warmth produced. Thus, by this unregarded and hitherto unknown manure, the greatest consequences are to be expected together; fermentation, and warmth in the soil, and the production of a neutral salt most favourable to vegetation.

The use of acids, and even the strongest kinds, has been found by experiments meant to produce effects actually contrary. Dr. Home, whose veracity is as unquestionable as his judgment, relates an instance of a gentleman who poured oil of vitriol on some rank grass in his court, which he wanted to destroy: and on the contrary, the grass grew stronger than before.

I wish he had given more particulars. Doubtless this powerful acid did destroy the plants on which it fell; but grass is hardy, and will grow from the smallest pieces of the root. Rains might fall, and diluting this rank acid, convert it into a rich manure, from which, the rank growth following proceeded; the same liquor which had destroyed part of the roots, assisting the growth of the rest.

Another natural circumstance might also favour this, and absolutely convert the acid to a fertilizing substance upon the spot. Court-yards are often paved with flat stones, and most probably this was the case in the present instance; for it is more likely a person should use so costly a liquor to destroy grass, which grew up in the small cracks between such stones, than such as spread itself more at large. In this case the acid might lose its force as a destroyer, and become a fertilizer on the spot.—The same author found, that vitriolated tartar was an excellent strengthener of the growth of plants: and vitriolated tartar is no other than this acid of vitriol, reduced by the alkali of tartar to a neutral salt. The flat stones used in paving are generally of the alkaline kinds, and they are as capable as the tartar itself, to convert the oil of vitriol into a neutral salt. Therefore, very probably, this was the state of the case. Oil of vitriol, which in its own state could not but have destroyed all vegetables, became, by its effect upon the stones, neutral, and a great fertilizer.

The practical use of this is evident. We learn first, that those soils will receive most benefit from acid manures, which themselves contain a great quantity of alkaline matter. Such are the limestone grounds and chalky lands; and for others, probably, the true way to advantage will be to mix the acid manure with an alkaline matter.

These substances are so common, and so cheap, that no difficulty can be started on that account. Chalk, limestone, and that kind of sea-grit which consists of broken shells, are all of this sort: but perhaps the greatest thing of all is behind. Marle is alkaline, and possibly an inconceivable improvement may be made by mixing this with the acid refuse of those wholesale chemists, who make spirit of nitre, aqua fortis, aqua regia, and oil of vitriol, or sulphur.

The quantity of marle required for the fertilizing of land is the greatest inconvenience in its use; and not improbably the mixing with that alkaline substance, a small portion only of this acid, a less quantity may answer the same purpose.

Let the practical farmer distinguish carefully between what we propose, and what we absolutely recommend: it is the difference between theory and practice. This is probable; and it will be well worth while to make the trial, because if it answer, the advantage will be very great: but there is a great deal of difference between what we know, and what we think: for in the latter we may be mistaken; in the former we cannot. We give these cautions plainly; for he would act on very different principles from ours, who should induce the husbandman to dangerous experiments, to please his own imaginations.

## CHAP. XXI.

### *Of the uncertainty of philosophical reasoning in agriculture.*

THE caution we have given the farmer to distinguish between facts and conjectures, should be extended to all writings on the subject of agriculture; for we are never so often or so widely deceived, as when we take for granted all that appears probable from our own reasonings.

No theory was ever more generally established, than that salts and oils are the things which give fertility; and of all salts nitre has been called the most capable of giving it: but the experiments of the author lately mentioned, seem to shew that all this fine reasoning is either erroneous, or at least, that it cannot be reduced to practice.

Oil of olives, the most innocent of any, in the small quantity of one ounce to six pounds of earth proved very hurtful; and salt-petre in the same quantity also rather hurt than assisted vegetation. But small as this quantity might appear to the experimenter, it was plainly too much, for sea salt in the same proportion was found also hurtful. In this case the quantity alone could be the cause of the mischief, for there is nothing in husbandry more certain, than that the use of sea salt as a manure is highly serviceable.

Upon the trials which have been made of the most powerful acids and alkalies, the preference seems due to the acid tribe. What we have mentioned as practically known of the acid of vitriol, is recorded also of the acid of nitre in experiments, that it promoted vegetation: whereas the spirit of hartshorn impeded it; and seemed indeed one of the poisons of vegetation. What has been found on the making experiments with spirit of nitre, favours the opinion before given, of the circumstance of oil of vitriol making grass grow strong; for at first the nitre seemed to destroy the principles of vegetation, but in the end it favoured them; that is, when just used it was too strong, but when blended with the moisture of the ground, it was brought down to a condition of service.

Brimstone has been found also destructive of plants, tho' at first it seemed to promote their growth.

Epsom salt appears to promote the growth of plants. A salt of this nature might be obtained cheap enough, for a small quantity serves for a great deal of ground.

These are the principal things which have been tried upon the subject; and it must be owned, that the results of repeated experiments have often contradicted one another; and the conclusions seem very equivocal. This lets down the importance of philosophy in the affairs of common life: but it is a truth, and must be owned. In the mean time, if the experiments of this sort have not all the authority that might be wished; it must not be denied that they have their use. The farmers employ all these substances in one or other of their liquors for the steeping of seed corn: and it is fit they should know which of them, upon these trials, have been found absolutely to hurt vegetation. The great caution on this head is against two of the ingredients, these are copperas and brimstone. We read many receipts in which these are used for the steeping of seed corn; and we see, by these experiments, that it must be a wrong practice, for that both of them are poisons to plants. The brimstone is the most dangerous of these, because the effect of it may be easily mistaken: it appears at first to assist the growth of those plants, which it afterwards destroys.



## C H A P. XXII.

*Of the effects of manures on different soils.*

**T**HE great requisite in a soil in point of consistence, is that it be firm enough to hold the plant upright; and yet open enough to give free passage to the roots. We meet with soils which are faulty in the two respects, of heaviness and lightness; or closeness and openness; but the latter, in a degree to be hurtful, are not nearly so common as the others; nor are they so difficultly to be remedied. The farmer has been told in the preceding parts of this work, that he is to bring these soils to good, by adding firm and stiff ingredients, clay to sandy soils, or clay and pasture earth to absolute sand, and so of the rest.

If he neglect this, and think to improve all ground by the same methods, he will deceive himself extremely. Dung, which is the common, and one might almost say, the universal manure, does no good upon many of the extremely light soils; and even tillage, on gravelly land; does mischief when obstinately repeated.

They seem to carry the point too far, who affirm that a very light soil will produce a better crop without dung than with; but if it be true that it will produce but very little the more for it, the disadvantage is sufficient, because the price of the dressing is lost.

Thus much probably is true, for the dung is either burnt up through the open surface of such a piece of land in dry weather, or washed away through its porous substance in wet: so that in neither case it remains with the roots, nor in a place where it can be useful to the plants.

If it be plain that manure is thrown away upon such soils, it is equally evident that a great deal of tillage succeeds no better on the gravelly, till they have been properly mended. These soils consist of round pebbles, and a little mould. The virtue is in the mould alone, and the plowing mixes it with the pebbles, but the next rains wash it in great part down. If the plowing be frequently repeated, this rich part of the soil is repeatedly washed away in that manner, and the crop has only straws to grow in.

Thus the very management of soils differs, and must differ according to their nature; much more the additions for giving them fertility.

Clays cannot be plowed too often; but the times at which they receive most benefit, are in the heat of summer, and just before frost. The exposing them to the full sun has, in some degree, the effect of calcination, which reduces clay to powder, and at once converts it into a fine rich soil. But it is just the contrary with those loose and open earths, whose better part we expose to be washed away or evaporated by these repeated turnings. If the richness of a soil depend upon any of the common manures, there cannot be a more destructive practice than that of often turning them up to the sun and air: for instead of receiving any of the expected good, they will lose vastly more.

## C H A P. XXIII.

*Of manuring clay grounds with marle.*

**W**E have observed, that the farmers are taught from father to son, that marle is not a proper manure for clay. It is even among their proverbial rhimes. But we have shewn that reason contradicts the absolute assertion of this proverb; and we are proud to acquaint the husbandman, that experience has confirmed that some kinds of marle may be very usefully applied to clay grounds, both in our own and in a neighbouring nation. The experiments of Dr. Home testify in little what is thus supported by fair experience in larger trials; and there is so far an advance made toward useful truth, that we have discovered an important error.

Let the English farmer therefore know, that marle is an excellent manure for a clayey soil, provided he chuse a proper kind. There are clayey marles, sandy marles, and shelly marles; of these the two last alone are proper for heavy and stiff soils, the other is peculiarly appropriated to light poor earths, and it exceeds any thing in improving them. The result of the Scotch experiments proves, that marle and dung are fine manures for clay; but we must add, that unless clay be first broke by a mixture of some other matter, as sand or the like, dung can be of little use to it: for the sun will evaporate its virtue, or rains will wash it off, as it cannot penetrate the substance of that tough soil in its natural state.

It is here impossible to pass over one remark on the ex-

periments made by Dr. Home on clay. He concludes from these, that sand is the worst manure of all others for clay. I shall not question the truth of his experiment, for his character is much above such doubt; but the conclusion he draws from it is absolutely erroneous. What we learn from it is, that we are to pay little regard to those experiments, which would lead us from what happens to a handful of earth in a pot, to reason upon the surface of a field: sand mixed with clay in a garden-pot produced the worst plants of all the experiments, in the others, of which lime; dung, marle, and the like were used: but sand mixed with a clayey soil in the fields of many of our counties in England, we have seen give fertility beyond all other additions. We are obliged to this author for the confirmation of the doctrine, that a well chosen marle is a good manure for clay; but we should leave the farmer in the way of much more error, if we did not tell him that the difference between sand added to clay in a pot, whose sides are heated with the sun, and through whose bottom no dew rises, and in a field whose coat of mould is only exposed on the surface, and is continually moistened from below, is so very great, that though the plants were parched up by the scorching sand in the one, they will be in no danger in the other.

## C H A P. XXIV.

*Of the manner wherein plants are nourished.*

**T**HE dews, rains, and winds we find feed the earth with the proper nourishment of plants: these are received by their roots, and thence conveyed upward so as to form a stalk, leaves, flowers and seeds; and these last being perfected, there is an end of the growth, both for the purposes of nature, and the service of mankind. Nature's purpose is answered, because in the seed there is a new principle of life; and the intent of the farmer is fulfilled, whose purpose in sowing was the ripening of the seed or grain.

What it is that the rains and air give to the ground as nourishment, has been strangely disputed: but this is evident, that all which was vegetable matter before, is one way or other discharged into the air, that great receptacle of all evaporation and assemblage of all things. If these particles, which plants had drained from the earth, being thus at length evaporated into the atmosphere, are thence delivered to the earth again, there is then only a succession of things, and the earth receiving back what it has given, is ready to give it again.

This is a plain solution of what is seen universally, that all decaying vegetables become manure to vegetables; and also the flesh and excrements of animals: these having either fed on herbs, or on others which had taken this food.

Thus the course of nature is a continued round, a circle which meeting with itself at its supposed termination, is always compleat, and always the same.

God created the earth in a condition to nourish plants, and placed the seeds of plants in it for growth; these exhausted the soil. But what became of that matter they had taken from it? If they putrified upon the spot, they returned to the earth and air all they had received. If they were eaten by animals, still the event has been the same: these animals have discharged a part of the vegetable matter in their excrements; and in the end all has been restored to the earth or air again; their bodies when dead, putrifying there: thus nothing is lost, only the place is changed. The air receives the great part of this exhausted nourishment of the earth; and the earth which is loose and spongy attracts and receives it again: dews and other watery vapours entangle it; and being too heavy for being longer suspended in the air, it falls and impregnates the ground afresh.

Thus is all nature kept in her true course: he who bestowed this quality upon the ground, knew in what proportion it was necessary, and he gave in that quantity; he allotted that course of things by which it should be continually exhausted and restored again; and thus preserves what he created.

When the farmer has tilled and dressed his soil; that is, when he has loosened its particles, and mellowed the mass, it becomes a kind of sponge to the air, imbibing its watery juices impregnated with all these nutritive particles, and retaining them till roots of plants receive them.

The powers of nature now very well known, convince us not only how the juices thus restored to the earth are received into the roots, and carried up the stalks of plants, but that it must be so. Wood, when out of a state of growth, if dipped in water at its lower part, becomes, by the ascent of the wet, moist in its upper; and we cannot



not conceive it strange, that this ascent should happen much more freely in the plant or tree while growing when it has a kind of life. The action of capillary tubes, in the ascent of fluids, is well known; and there is no instance in which it has so necessary or so apparent force as in the present case.

Beside this power, there is the attraction of the parts of the fluid to one another, which cannot fail strongly to assist in carrying up the sap to the tops of the highest plants.

The ascent is continual, because there is continual room made for the sap in the upper parts, by the constant and uninterrupted evaporation.

A circulation has been supposed by some in plants, as in animals, but it is an error. There is a nutritious juice from the earth, thus sent continually up from the root to the top of the plant in certain vessels, and there is a descent of other juices received by the extrem parts from the air, and carried downwards. This gave the notion of a circulation; and though erroneous, it was not an unnatural one: but we now understand vegetation better.

The motion of the sap in plants is much slower than that of the blood in animals; and it is in various parts detained and retarded in the glands; where it is changed into various juices of different consistences, colours, and qualities, on which depend the virtues and the value of the plant.

While this change is performing, the watery parts are exhaled, and the whole stock becomes richer; and thus the remainder at once nourishes and extends the several parts of the plant, and gives it all its sensible qualities. The grosser and the more subtle parts of the general nourishment received by the root, are separated in these operations, and the power of vegetation effects in a manner what we see done by chemistry from the same principle of separation and combination. Do we wonder that insipid earth and tasteless water give opium to the poppy or scammiony to the bind weed? let us observe that from tasteless hartshorn without any addition, the chemist brings a pungent spirit: and shall we wonder nature does this in the much finer vessels of plants. Indeed we have been accustomed to look upon plants as constituting too mean a class in the great order of nature. Though they have not sensation, plainly they have many of the properties of animal life. They rise from seeds as animals from eggs, and the difference between seeds and eggs is very little: they are nourished by food taken in at certain destined parts; fine particles of mould, air, water, and the various substances with which these three are impregnated. They have their periods of growth as regular as animals. The oak they say is a hundred years a youth, as long mature strength, and as long subject to the infirmities of age, under which at length it decays. This account is not so far from truth as vulgar observations often are: and in annuals we see the same course in a short period. They are not destitute of motion, though they have not the power of changing place. The marygold closes its flower at night, and the abrus opens and shuts its leaves as we do our hands or fingers. The sensitive plant has yet more obvious motion. The course of their juices answers in some measure to the circulation of blood in animals, and they have various diseases.

This places in a higher light the objects of the farmer's care, and shews him that it is easy to improve their growth.

It is his business to have them vigorous and full of good juices, and to this purpose he must supply them with good food. We have shewn the method by which this is to be done, and he may learn from reason as well as from experience, that if he direct his labours rightly, they will not be fruitless.

#### C H A P. XXV.

##### *Of the management of mossy ground.*

**B**Y mossy ground is meant a soft boggy matter extending over large tracts, and containing in vast quantity the remains of vegetable substances, so as often to seem in a great measure composed of them. This soil is always damp and rotten, and it is in a great measure given up as useless. We have a great deal of it in Lancashire, and the neighbouring countries, and much more in Scotland and Ireland. The attempts made to drain and render it useful in England, we have given in the preceding part of this work; but since that there have been some new undertakings here, and some very rational thoughts published on the subject in Scotland. From these opinions and the practice of our countrymen, we shall be able to give some additional directions to the farmer or land owner who has such ground.

There is always water pent up in these grounds, and this

is one great reason of their barrenness. It takes a tincture from the vegetable substances which lie among it; often so strong as to become a kind of tan, preserving animal bodies for ages, when they have accidentally fallen into it.

Water thus impregnated cannot be proper for the growth of plants; and this quality, together with its abundance, is the great cause of the barrenness of these grounds. For the materials themselves, of which the ground is partly composed, are no enemies to vegetation.

Experience proves, that all vegetables in a state of decay, are a manure for other plants; and the substance of mossy soils, we have observed, is principally composed of these. But we see how it is they may be useful, and how they are destructive: and this may be a lesson to the farmer in his management of the like substances as manures. If he expects good from them, he must use them so as to make them decay, and the great article is moderate moisture; where they are detained in a great deal of water, we see instead of decaying, they impregnate that fluid with particles which are enemies to vegetation. I know from repeated experiments and observations, that the water in these grounds constricts and hardens the extrem fibres of roots, so as to stop all communication between them and the rest of the plant.

What farther relates to the composition of this peculiar soil, is the earthy part which has originally been lodged there, or has been accidentally washed down thither from the higher grounds. Mr. Maxwell justly observes, that on the nature of this depends in some measure the absolute quality of the soil; but that is much more influenced by the degree of moisture, and in this respect universally, the more wet it is, the farther is it from use in vegetation. The method of draining we have given before; and this is the first necessary step: the next is destroying the original produce of the surface, which in the wet state wherein the land has lain, cannot but be useless, and if not perfectly removed, would be pernicious. The best and most certain method is by paring it off, and burning it upon the spot.

This destroys all the remains of roots which run down deeper than the coat that was pared off; and it leaves an useful alkaline substance upon the ground.

Over the ashes let there be scattered a large quantity of some harsh lumpy mould. It need not be rich, for there is fertility enough in the natural soil itself, when it is brought into a condition for service. The sand in this addition cuts and breaks the spongy matter, and the land becomes at once serviceable.

This addition should be made every year after, and with it some dung; and thus the fertility first given, instead of being lost, as is often the case after a few years, will be continued and increased.

In the preceding part of this work we recommended for soils of this kind, the sowing the coleseed plant; and we are proud to see they have carried this good practice to the remotest part of the kingdom with success. The best method is to burn the thick haulm of this crop upon the land: and after a second growth to prepare for seeding by sowing clover and ray grass: this will produce a very good profit, and will even, without the repeated additions of manures, which we have directed to be used if it were kept in tillage, preserve the recovered ground in heart; and keep up a succession of crops as upon other land.

Under the article seeding, this ground is to be treated in a particular manner. Being newly recovered from absolute bog, it is not in condition to bear the feet of cattle, and having been enriched by plowing in the ashes of the last crop of coleseed, it does not want their dung for manure. Therefore the proper way of using these grounds, when sown for seeding, is by cutting the crop, at a proper growth, in such quantities as are wanted, and giving it to the cattle green in the racks.

This is a practice we have recommended on other occasions, treating of the artificial grasses; and there is great advantage from it in all respects. The cattle do not destroy the heads of the roots by treading them to pieces, nor by gnawing them too near the ground, and these being uninjured, shoot up much the sooner and stronger from the cutting, than they can do from eating even in the most favourable manner.

We have observed often, that the garden is the school for farming: and what is practised there will always be right so far as it can be introduced in the field. When young shoots of trees happen to be gnawed by cattle, the gardener cuts them off smooth below the part with his knife; or if any of the plants or flowers have been cropped by an unskilful hand, he follows with the same instrument for the same purpose: his success shews the truth of the general rule, that



that whatever is expected to grow again advantageously, should be cut off with an even surface. It would be absurd to follow the teeth of cattle with a knife; but it is easy to have the same advantage by keeping them off the ground, and cutting with a sharp scythe what is needful for their support, as it is required.

There will be none cut but what is eaten, nor any before it is wanted, every day's food will give a day more of new growth to the last, and a moderate field will thus keep a good quantity of cattle in succession.

All this time the ground in the present instance is acquiring firmness, and that is a very essential article. The roots are at the same time strengthening themselves; and when the farmer has continued this course of cutting and feeding; and cutting for hay in other parts as long as he judges proper, the ground being become firm, the cattle may be turned in upon it. Their urine, their perspiration, and their dung, will be of vast service, and the growth will be too much strengthened for the destruction it would otherwise be exposed to by their feet. The dung will at once nourish this growth, and prepare the ground for a future crop; and when it comes to be plowed up, it will be no more of the nature it was of before the draining and improvement. If every thing have been conducted according to these directions, it will be a dry, black, loose and rich soil; much like that finest of the black land in the fens, which has all the advantages of those countries we have lying in the reach of the water.

The ground will now very well bear the common crops in the usual order of husbandry, and the farmer may consider it as the rest of his land; only he should at times renew the dressing of ashes, for there is a natural sourness, as the farmers call it, in the land that has been very long wetted, which nothing keeps down so well as this practice. The great article is the alkaline salt which ashes afford; so that if it be at any time inconvenient to burn the remains of the crop, a dressing of ashes of weeds brought from a common and burnt elsewhere, will be of great service: but nothing of this nature will be equal to the absolute burning upon the ground where more is required, and where that regular process can be performed with convenience; for there are oils and other parts in vegetables which go off with the smoke, and floating over the surface impregnate the ground; and what is much more than all the rest, the very act of fire disposes the soil to receive the influences of the air beyond all other things, and promotes fertility extremely.

There is one disadvantage attending the management of this sort of ground, which is, that heavy cattle cannot be born upon it for the first seasons, to do the necessary services of opening the soil, and covering the seed of the first crop: all must be done by labourers; but this is not so heavy a task as might have appeared at first, for it is a soil that is more tender and more easily managed than any other. No one would conceive who has not seen the trial, how much of it an honest labourer will work in a day, and there is the advantage, that every thing which is done by hand is much better done than what is wrought in any other manner.

During all the time of recovering and of using this kind of land, an eye must be had to the drains, to see that they perform their office; otherwise all that is done else is thrown away. The ground will become drier every month till it is in the condition of land which naturally lies better; and the great proof that it is perfectly recovered, will be that rains take no more effect upon it than they do on other land.

We owe to Mr. Maxwell, a gentleman, who has very beneficially turned his thoughts to these studies, the excellent hint of planting a recovered land of this kind with potatoes. We have on another occasion shewed the farmer how very well worth his regard this root is; and there is no ground on which it will succeed better than on a recovered mossy soil.

This root requires rich nourishment, and a free mould, where it can spread and encrease without stop or interruption; and this it has in every sense perfectly in the ground of which we are now treating. The earlier the root is planted in these soils, the better; and the haulm at autumn, when the roots are taken up, is of an excellent kind for the service of burning.

Where manual labour is most required, this root is properest of all, for it will answer the expence of garden tillage: and the gardener cannot have more proper ground for it. Therefore the farmer needs not spare this kind of management. His potatoe ground costs less, and the labour, though it so far resembles that of the garden, that it is done by hand, yet has not all the expence. The ground will

be better dressed this than any other way, and the potatoe will answer to the difference between the price of common field tillage, and this by hand by the encrease in number, bulk, and excellence.

The disadvantage attending potatoes on this mellow kind of ground, is, that they are more exposed than in any other to the effect of the autumnal frosts. This is to be owned, and farther, that the more of the original moisture remains in the soil, the more they will be exposed to that mischief; but it is easy to be avoided. It is for this reason that early planting is directed. They may in general be put into this ground a fortnight sooner than into the common land, for as they will strike quick in it, they will escape danger: and being thus early planted, they will be early ready to take up: particularly as they will encrease more and faster in this land than any other. They will be fit for taking out of the ground with great advantage, before the danger of frosts arrives.

## CHAP. XXVI.

*Other crops proper for a recovered mossy ground.*

**A**NOTHER crop that will very prosperously succeed upon this ground, is the PEA KIND, and there are seasons in which they fail in other soils, and which will make them on the contrary prosper better here.

Pease, even of the coarser kinds, are properly a garden product, and they are therefore precarious in a field. The present season has given us an instance of this, the pease throughout the generality of the kingdom have failed; and the distillery having been at the same time, in a great measure, stop'd in the use of corn, there has been no food for the hogs. Any man who could have foreseen this, and have planted them in such ground, would have made a vast advantage. This is another of those crops which will pay the expence of tillage by hand upon such a soil; for it puts the growth into the condition of those in gardens, and the encrease will be beyond all thought greater upon such a piece of ground so dressed, than upon the best land with field tillage.

WOAD is another crop that will succeed excellently upon a soil thus recovered from the mossy condition; and will very richly repay any expence of tillage by hand, for the same reason, because the produce will be much finer and more in quantity from ground wrought by hand, than from the common course of tillage.

The large leaves of woad require a great deal of nourishment; and they can never have this but where the ground is perfectly well broken and divided; this can be done no way so well as by the hand work of the labourer.

Nor is this the only occasion on which the garden culture may be employed profitably in the field.

## CHAP. XXVII.

*Of mossy land with a clay bottom.*

**I**T is not an uncommon case that one of these mossy grounds lies upon a clay, and that at so small a depth under it, that when the surface has been burnt, the clay will come within reach of the plow.

These soils, before they are improved, are the worst of all the mossy kind, but it is not difficult to make them the very finest by due culture.

No mossy ground is so thoroughly wet, or so perfectly rotten as this which lies upon clay, but this will only tend to the advantage of the crops if they be rightly managed upon it; and the necessary care first taken to drain and render the soil firm.

The draining is in no case so necessary to be thoroughly and perfectly performed as in this, but it is in none so easy. The clay is a bottom, through which no wet from any cause can rise; and as it generally carries a level surface, the drains need only be cut half a spade into the body of it, and all will be carried off. They must be numerous in such a ground as this, because it is not proper they should be large, and they must be all carried in a perfect straight course drawn by line and measure.

The boggy matter above will shrink in a surprising manner, because the greatest part of its substance was watery, and there will in many cases appear too thin a coat of the vegetable mould for service.

This is a fault easily remedied, for a part of the clay may be after a time turned up among it: but this will require more caution than is usually thought.

In general the land owner, who has ground of this kind, should know, that though it appears the very worst of the boggy sort, it will be found capable of becoming the very best with a moderate share of trouble; but he is to



be told that none requires so much nicety and management in all the proceedings.

When it is drained by a number of these little cuts, the cause must be removed by one large drain opened according to the directions we have already given on that head, in such manner and course, as constantly to carry off that wet which used to occasion the moisture.

The present wet being thus taken off, and the future occasions of the same mischief prevented, the farmer must wait with patience for the drying of the surface of the soil, and when this is in a condition to be pared, it must be done, but to no great depth; and in the succeeding burning, great caution must be used that it do not go too far.

The proper method is this, when the surface is pared off in this manner, let the parings be set up in light and small heaps at distances from one another; and let there be also thrown down here and there some barrows of good pasture mould.

When the parings are dry enough to burn, let fire be set to them, and let the farmer stand over the burning with a watchful eye. The danger in common operations of this kind is, that the matter should not burn enough; in this case it is, that it should burn too much.

In the generality of land, the earthy part makes up the mass; and this is only capable of calcination from the burning materials, which are the roots, and other remains of plants: but in this case the very substance of the soils, in a great measure made up of vegetable matter, which, though it was tan'd, as it were, in the wet, yet will burn very fast now it is dry.

Two damages may arise from this, if a careful attention be not paid to the burning. The heaps of parings should only be burnt to a red coal; but they will consume to a small quantity of light ashes, if suffered to burn without stopping them; and as the very substance of the soil is in a great part composed of inflammable matter, that will also take fire from the heaps, and burn down to the clay.

A careless person might thus burn away the land he meant to improve, and leave only the clay.

The use of the earth that has been ordered to be laid in heaps at small distances, is to prevent this. It will be necessary to stop the fire; and nothing does this equally with earth. Water is a poor extinguisher of fire, in comparison of mould. Wet only checks, but mould smothers it.

When the heaps are burnt to a red coal, let the mould be thrown on them; this stops the farther burning, and the ashes will be full of virtue: the mould also becomes calcined, and is improved into a manure, the best of all others for the present service.

This is the general use of the mould, but it may be wanted particularly. If in any part the ground take fire about one of the hills, or it seem burning downwards in the hill itself too far, a quantity of the mould must be thrown on. It will stop the progress of the destruction, and repair the damage.

When the whole ground is thus regularly managed, the fire must be suffered to go out, and the earth to cool; then advantage must be taken of a calm day, after a shower of rain, and the heaps must be broken, and the ashes and mould scattered equally all over the surface.

This done, the sooner they are plowed in the better; and thus the ground, be its depth never so little, will produce one good crop: after this, it will be necessary in these shallow soils to add to the quantity of the mould, by plowing up a part of the clay with it: but this must be done with caution.

The more is necessary to be said on this head, because a mistake is easy: the plowing some of the clay up among the mould, is all that is required; and an author, of whom we have just spoken with deserved respect, directs this to be done without farther care.

I have seen the experiment tried with very bad success. The clay is too tough and heavy to mix with this light and loose soil, and there is nothing here to break it. In such ground I have seen the clay lie in loose, thick lumps among the soil, and never in the least mingled or embodied with it. Thus it chills the growth it was intended to assist in nourishment; and encreases the bulk of the soil, without adding any thing to its real quantity, as to the service of the crop. The roots of what plants I have taken up for examination, have, whenever they come to such a mass of the clay, turned round it, and not in any part penetrated it.

This is the case in plowing up absolute clay among a mossy soil; perhaps that which Mr. Maxwell mentions may be loamy; and in that case, the sand in its composition, when exposed to the air, would break it, and it would mix

with the clay. Little accidents in these things make great alterations.

In the case here named, such as I have seen in some of the English mossy grounds; the farmer is to improve his soil, by mixing with it a part of the clay, but he must also add some harsh and sharp ingredient to tear that asunder.

We suppose the ground now dry enough to bear the feet of cattle, and the common field management; the clay lying at a foot or more in depth, is yet somewhat moist on the surface, and is just in a condition to cut easily.

Let the plow be set so as to cut up about three inches of it; and to prepare for the breaking of this, let sand, or some such ingredient, be strewed in a moderate quantity upon the ground.

The natural condition of our best soils, which are the hazely loam, is this: they consist of mould, clay, and sand, very well blended together: these three ingredients, when well mixed, make the best natural soil: and it is not difficult, in this case, to convert the present ground into such by art. Here are two of the ingredients, mould and clay; there wants only the harsh part that should cut the clay to pieces, and render it capable of mixing with the mould. This is easily added, and the most familiar and common in use is sand. But something of improvement may be thought of. If sand be used, sea-sand, if in the neighbourhood, is the best; if this cannot be had, the cleanest and largest river-sand is next in goodness; and if this cannot be had, the coarsest pit-sand must be chosen, and this must be washed before it is laid on. The washing is easily performed, by pumping upon a large quantity, and stirring it about with a broom, till the water runs off clear. This is necessary whenever pit-sand is used as a manure, because there often is an ochery matter among it, which being full of particles of iron, is an enemy to vegetation.

If the farmer, who must of necessity use pit-sand, thinks of his business in time, the sand will be excellently prepared for this use, by throwing it in a heap open to the weather, and turning it once or twice. This is easily done; the rains will wash it, and the effect of the sun and winds will in some degree calcine it.

The best ingredient of all is, the dust of limestone; if there be a quarry near, or if from a mason's yard enough of the waste of his work, excepting the refuse of marble, can be had, it answers better than any thing. These fragments cut the clay in the succeeding plowings, and the soil gets a lasting improvement, as their warm substance moulders away.

In some cases moss and those weeds which were the original produce of this soil, will infect the crops sown upon it. This generally happens from the draining, or the burning not having been sufficient; and in this case it is of great use to add to the sand, or stone dust, a quantity of coal ashes. There is something in the nature of these that destroys the seeds or first shoots of moss, and they will assist in mixing the clay with the mould, for the forming of a soil.

These substances, whichever be used, must be scattered over the soil before it is plowed; and they will, after a second plowing, shew their effect. The tough clay will be seen broken into smaller lumps, and mouldering away; and by degrees this, with the sand or grit, will mix thoroughly with the mould.

The soil will thus gain depth and a due firmness: the clay will give it a body to support the crop upright, which is often wanting in these rich and mellow soils; the sand, at the same time, will give openness and a free passage to the roots, and the mould will afford nourishment. This is the compleat composition of a soil; and there is scarce an instance in the course of agriculture, in which the farmer may so easily give the condition of the best soils, to one which is naturally the worst.

There is this great advantage also, that the benefit is lasting. The good effect of manures, even of the best of them, lasts but a certain time; but when soils are made in this manner, the advantage remains for ever. The ingredients themselves, and the necessary turning of the soil in mixing them, give fertility for the two or three first years; and the ground is for ever in a better condition to receive the refreshment of manures.

If the farmer find he has given too much sand, let him the next year plow up somewhat more of the clay; and, on the contrary, if he find after the first season, that the clay remains in lumps, and unmixed with the mould, it is a proof that he used too little sand; and he is plainly directed to throw on more. This is easily done before the next plowing; and its effect will be much more sudden, than that of the other, for the clay being disposed to break



by the preceding addition, will be immediately torn to pieces by this, and the soil will be made fit for any produce.

### C H A P. XXVIII.

#### *Of preparing mossy grounds for natural grass.*

**N**O use can be made of these mossy grounds, till they are drained; but when that is done, if they are not wanted for tillage, nothing is so easy as to make them into pasture ground: and with due management they will produce what is very fine both for the scythe and feeding.

The most convenient of the mossy grounds for this purpose, are such as owe their wet condition to their situation under hills, from whence the rains drown them.

When a drain is made for such a piece of ground, let a sluice be set up, so that the effect of carrying off the water can be stopped at pleasure, and the surface overflowed.

This preparation being made, let the ground be drained in the usual manner, and the weeds pulled up by the roots. There will be no need of the expensive article of paring off the surface, as there is in such ground of this kind as is intended for tillage. Only when the weeds are gathered up, let them be piled in heaps at small distances, and set on fire. Let a calm season be chosen for this, and when the ashes are cool, let them be spread over the ground. When the first hard rains come, let the sluice be shut, and the water that comes from the higher lands thick and loaded with the finest parts of the soil, be suffered to cover the whole surface of the new drained ground.

The surface in this state will be bare, and naturally level. The wet condition of the ground before draining, would have settled it even, and the large weeds having been burnt upon the dry surface, the moss and low stuff which had been killed by draining off the moisture, will have burnt with them. Therefore the natural condition in which the ground will be found at that time is bare and level. The water let over it will not be able at once to penetrate it so, as to make a bog of it again; and as it can be kept on as long as the farmer pleases, and let off again when he has a mind, there will be no danger of such mischief.

Let him keep the water on so long, as that it may deposit its rich sediment; and then by opening the sluice, let him carry it off again. This must be repeated three or four times during the rainy season, and the level surface will, by this means, be covered with a very delicate rich mould. The first coat of this will be thin, and it will crack in drying; the next will half dissolve it, and fill the cracks with mud nearly of the same consistence, and the succeeding will cover it entirely into a uniform mass, and that of the finest kind for the growth of grass that can be any way obtained.

This is introducing *Ægyptian husbandry*; and by this we shall have, from our own art and industry, all the fertility the people of that country receive from the so famous and immediate gift of nature.

The consequence will be, that not only a present crop will flourish, but it will last as long as the farmer shall take any care of it. The grass that is to be sown on it will penetrate through this light and rich coat, and spread its long roots into the new drained soil: the rains, which cannot carry off the light addition from the surface because of its level situation, will wash it in among the roots. At repeated times the same rich, but unexpensive manure, may be added by the same means; and the crops will from year to year encrease with the absolute quantity of the soil.

The first coat, which we have thus directed to be laid on, will effectually bury, choke and destroy any remaining shoot of the moss or sun dew, or other slight rooting products of the original soil; and the last will leave the surface in a condition to receive the seed of the succeeding crop.

Nothing is so slovenly managed in all the farmer's business, as the sowing of hay seed; but on such an occasion as this, there cannot be too much care taken about it.

Naturalists reckon many hundred kinds of grass, and among these, some will never grow well but upon damp ground, others upon none but what is perfectly dry. Some require a rich mould, and others will not shoot unless upon a warm gravel. In sowing of grass the farmer, when he has occasion to do it, takes the seeds of any of these kinds, and scatters them upon the ground in as careless a manner as he had gathered them. Is it a wonder he has little success!

The true method is this, chuse the seeds from such grass as has stood on a spot not unlike that whereon it is to grow; and for the present purpose, the very best choice is from a meadow that lies low, but not so as to be overflowed. From the hay of this meadow let the seed be sav'd; let the farmer keep it with care till the time when it is

wanted, and then sow it with a plentiful and even hand, at a time when the last overflowing of the recovered ground has been so long off, that the mud left on the ground is just hard enough to bear a labourer's feet.

When the seed is thus scattered in a calm day, let a labourer go over the ground with a small bush harrow, such as we have described in the preceding part of this work, and thus tear up the light soft surface of the mud for burying the seeds.

The rest may be left to nature: they will shoot quickly in so favourable a soil, and the place will be covered with a thick and excellent verdure.

The innumerable roots of the grass will bind together the new coat and the under surface, and there will always remain the power of overflowing the ground, and of lodging a new and large quantity of manure upon it without expence.

The first years crops can be only mowed, for the land will not bear the treading of cattle to feed upon it; but if two crops be cut this year, the roots will be only the stronger and better for it.

After this it may be treated as any other grass ground, and from being a piece utterly useless, it will become of equal value with any the farmer has for pasturage.

The convenience of overflowing is of great advantage, because it adds a fine soil, and saves manure; but moss ground may be made fit for pasturage where there is not this particular convenience. Draining is, as in other cases, the first article, but after that is done, the soil must be improved before good grass is to be expected, for it wants many of the requisites to bearing it.

This is to be done by the addition of some lasting ingredient, and nothing is better than absolute pasture mould. The best kind is that which is of the nature of what we call hazely loam; and that which has in it a good proportion of sand, and small stones is the best. These work their way into the soil, and warm, break, and divide it at the same time that the mould gives it absolute fertility.

This dressing will be expensive, because it must be laid on in large quantity; but if the drains be properly made, and the dryness of the soil continue, the lasting advantage makes very good amends for the first charge, for by this means the before useless ground is put into the condition of a good natural pasture, and will require afterwards nothing beside the common care. The ground thus rendered fertile for pasturage, will be in all things the same as if it had been originally such, and with the usual dressings of dung and pond mud will be always in order. There is no soil on which dung takes a more happy effect than this; but the care must be to lay it on at a proper time, or its virtue will be lost. The older the dung, provided it have not lost its virtue, the better it agrees with this land, and it should be laid on before the first spring rains.

A dressing of the common kind will answer very well for three years grass upon this soil; but if this quantity be divided into three portions, and one of them laid on every year, it will answer much better. The price of carriage and the trouble of spreading are so little in this article, that this is by far the best method of dressing.

### C H A P. XXIX.

#### *Of the management of the worst kind of moss land after draining.*

**I**N the common course of things the methods here laid down for the recovery and preservation of moss land in a state of use will answer very well: but there are some soils of this kind, which though they have been ever so well drained at first, and ever so properly managed afterwards, will shew signs of returning to their old condition, not in the dampness; for if the drains be well cut, that is impossible, but in the bad growth. In this case moss usurps the place of grass in pasturage, and the little sour weeds which used to rise upon it, appear among the crops from tillage.

The remedy is not difficult. If moss be the case a mixture of lime and coal ashes sprinkled on early in spring, destroy that and recover the land, if the other case, lime alone.

This is the difference that successful practice seems to establish in the two cases: in pasture grounds moss alone is the interruption of the growth, and for this evil a good quantity of ashes with the lime are the proper remedy; but in plowed land the appearances of the ill condition of the ground returning are various, but lime mixing freely in the soil destroys them all.



## C H A P. XXX.

*Of the use of mossy soil as a manure.*

**A**S we see that common poor pasture mould laid upon a piece of a recovered mossy soil, reduces it to the condition of very good ground, it is easy to perceive that the mixture of mould and this soil makes rich land, and it is a very natural thought to bring the mossy soil as a manure to such pasture ground, as well as that mould for a manure for the mofs. This practice and experience also confirm. We have the first instance of it from Scotland, but it is a very strong and successful one. Mr. *Heron* of Bargerly improved a light weak soil in tillage, by the addition of mofs as a manure, so as to make it bear repeated and profitable crops; and Mr. Maxwell has communicated it to the publick among his excellent papers on husbandry.

From what we have seen in England of this, we shall be able however to give the farmer one practical caution. There are several kinds and conditions of mossy grounds, and all of them are not equally proper for this service.

There is one kind of the nature of peat, which is by no means fit: it is so tough that it will very difficultly be got to pieces, and so sour, that it rather hurts than improves the ground: there is also another kind which is heavy and tough, and no more proper than the former. The mossy soil I have seen used with success, is full of rotten wood, sticks and branches of trees, with hazel nuts and other fruit, yet remaining in their perfect form. The soil which contains these, is the lightest of all the kinds and the most fertile. The liquor which has filled this earth has preserved these, as it will preserve even the flesh of animals: but when they are exposed to the air and sun, they dry and moulder away; and become a rich and excellent manure.

The farmer will not be doubtful of this who remembers the general observation, that all vegetable substances in decay become a manure for land; which is an invariable truth.

## C H A P. XXXI.

*Of the management of exhausted ground.*

**B**Y exhausted ground the farmer is to understand such as has been in its nature tolerably good, but has been drained by repeated or ill managed crops, beyond what the common manures are able to supply.

This is the case of a great deal of land in our kingdom; and if those who complain would use the proper means, they would find the damage not so hard to be repaired as they imagine.

Long fallows will recover the most exhausted land, provided it has been ever good, and the ground be sufficiently broke during the fallowing: but in this case the labour and time necessary for the recruit weary the farmer, because he receives no present benefit. It will be more agreeable to him to lay out more expence, and to reap a more immediate return.

In this case the advice given by the Edinburgh society to Sir James Ferguson, and published among other excellent papers in the volume which the publick owes to Mr. Maxwell, will be of excellent use.

It is fit on this occasion to give that society its just praise. Other bodies of a like kind declare against ever giving their opinions as bodies, the fear of being mistaken overcoming the hope of utility: but this society consulting and considering utility only, receive states of particular cases, and give their advice. This Mr. Maxwell has made general by his publication; and more than their own kingdom are obliged by their labours.

It is no more than justice to add, that whatever these gentlemen have given as their opinion in that kingdom, the practice of this confirms: but as agriculture is more advanced in England than Scotland, while we adopt, it may often be in our power to add something to their opinions.

In the present subject which they have considered at large, the remedy doubtless lies in giving a new soil. This may be either brought on from elsewhere, or raised from greater depths in the ground. The latter is the easier method, but all soils are not deep enough to bear it. Therefore the first consideration is the depth of the mould.

If this be no more than is usually kept in tillage, or than is in the common course of labour turned up by the plow; some fresh soil must be brought on, or manures that are of the nature of soil, river mud, marle, or pasture mould.

In this case the care of the farmer must be to suit his ad-

dition so to the nature of the original soil, that it may serve at once as a new earth and a manure. This will be found treated at large in the first volume of this work, where we have considered soils and manures.

In the other case, where there are several inches of good soil below the utmost depths to which the plow has ever gone, the whole business is to cut deeper, and turn it up.

For this purpose, if the four coultered plow be brought into the ground, and set to its proper depth of cutting, it will go three, four, or even five inches below what other plows have done; and will bring up an absolute bed of new mould.

The old exhausted part of the soil will be buried at the depth where this lay; and this, which is of the nature of virgin mould, will be the proper seat of the next crop.

The advantages of virgin mould are well known; and this part of the soil, which will be thus turned up after such absolute and unexhausted rest, will be perfectly of that quality. The roots of corn and of the other plants cultivated by the farmer, seek their nourishment where the earth is broke by tillage to give them passage. The preceding crops upon such grounds have been fed by that part of the soil only, which has been wrought in tillage; and this part which is now broke for the first time, having been firm and solid at its proper depth, has denied them all admittance. Therefore it is now in full strength. The farmer will see that it is by his crops, and he is to manage it in this manner.

He must take care that his four coultered plow cut up this under part of the soil every where, and in all parts equally. He must see that the part thus brought up make the surface of the whole field, and that the old top be every where buried.

This once done, there is to be no more of the deep plowing: the common course of work is to be continued, and this new earth very well broke.

After this it is to be sown as other good land; and refreshed in the same manner with manures; and after a course of many years, it will be proper to bring on again the deep cutting four coultered plow; and burying the upper soil, to bring up again that which had been in the preceding time the exhausted surface.

It will have received new strength from its long rest, and from the vapours from below, and will be as rich as the former. One caution only needs to be given the farmer on this head, it regards the crops he is to sow upon the ground, all the common kinds are free to him: corn of every species, all the pea and vetch kinds, turneps and clover, what he is to avoid on the deep rooting artificial grasses. If he should raise sainfoin on such a piece of ground, and expect afterwards the old soil, when turned up, to be fresh and full of virtue, he would be disappointed; for the roots of sainfoin draw their nourishment from great depths, and the buried part of the soil would be thus drained of its nourishment perhaps faster than it was recruiting.

For the same reason this benefit is not to be expected even in deep soils, where there has been a crop of sainfoin; for the under part of the soil, though not touched by the plow, nor at all affected by common crops, would be exhausted by this deep rooting plant; and in this case, though the soil be ever so deep, the only resource for its improvement, when exhausted, must be the bringing on new mould as directed in the case of shallow and exhausted soils.

## C H A P. XXXII.

*Of the management of this land after plowing.*

**T**HOUGH there be no more deep plowing required after the first, supposing that to be well done, yet there will need a great deal of care in that; and a repeated tillage of the soil, though of a lighter kind, in the succeeding time.

The first care is picking out all roots of perennial weeds. The turning up the earth to this depth gives a very good opportunity, and it should not be omitted. If a boy follow the plow for this purpose, the work will be done at once: but there need not be any nice care on that occasion, because the harrowing that must come after will clear away the remainder.

This harrowing is very necessary for breaking the clods of the new soil, and mixing it with the old. It should be done with a great harrow, such as we have described in its place; and after this, in a dry season it will be proper to go over it with a very heavy roller to crush and break it more, and then to harrow it again with a common harrow.

If this be properly managed, the plowing which follows in a common way, will put it into a condition to receive the



the seed corn, and from this time it may go on in the usual course of tillage.

### C H A P. XXXIII.

#### *Of the management of land according to its situation.*

**T**HE keeping up a due proportion of the ground in tillage and pasture, is an article of great importance to the farmer: and at present it seems to have been ill conducted in general throughout this kingdom. While we pay the most extravagant price for corn, the people concerned are applying to the government for liberty to bring in live cattle, because they have not enough for their seed-ing grounds. It is plain they have encreased the quantity of pasture at the expence of the tillage.

Let the farmer be aware of this in his private concerns, for he shews the disadvantages of the nation.

In proportioning his ground for this purpose, he will find some that is naturally calculated for and appropriated to pasturage, and other parts which are in the same manner set apart for tillage; but there will be also some of a middle nature, which may serve with the proper management for one of these purposes as well as the other. This is the kind of ground, which when he has occasion to change the proportion of pasturage and tillage in his farm, he is to convert from one of those services to the other; and this, in the common state of things, he is to allot to the one or to the other of these purposes, according to the present occasion: or if at liberty on that head, he is to be guided by its situation.

In general lower grounds are fittest for grass, and those somewhat on an ascent for tillage: but in a piece of ground where the choice is indifferent, let him be guided by the degree of the descent. If the place be exposed to rains and the washing of higher grounds; and there be also a large and swift fall from it to the lower, it will be best to lay it for pasturage; because in that case the turf will cover and preserve the manure, which shall be first given to the land; and the entangling blades of grass will detain some part at least of that fine mould which is washed from the higher ground, and which will serve as a manure for the pasture; whereas if this piece of land were put into tillage, the waters of floods running down from the higher grounds, and over this would carry away with them not only that light mould which enriches it, and which would be detained by the grass; but the very manure also with it, which should have been laid on to enrich that spot.

Thus by a different conduct, the situation of the ground will be either an advantage or a disadvantage.

This is the direction which reason gives, and which experience confirms, respecting the situation of various lands: and by this management alone, I have seen the difference one half the value of the produce, between adjoining grounds upon the borders of the fens in Lincolnshire, where one has been thus managed according to the necessity of its situation, and the other without regard to it. A great deal of good land in that part of the kingdom lies shelving toward the fens, and under the course of much water in flood times from the higher grounds beyond it.

The soil in this border of rising land, which joins upon the fenny flats, is the same with that of the fens themselves, a rich, mellow, dark mould; and this, although it be but moderately fertile in the fens, where it is subject to too much moisture, yet in those lighter grounds where it is dry there is no soil richer.

This is proved by the large crops it yields when tilled for corn; but these last only a few seasons, and then no art recovers the first strength of the ground.

This depends entirely upon the situation of that land; and it is fit we should explain it, for it is not in Lincolnshire alone there is rich earth in this situation; nor can just directions for one piece be given that will not be useful for others.

When a piece of grass land in the country just named, which lies in this situation, is broke up for tillage, the first years crop is very great, the second tolerable, and the third poor.

The reason is not only the exhausting of the soil by three successive crops, for that it has only in common with other land, and could bear it better than any other, because of the great natural fertility: but all this time the rains from the higher country are washing away the fine part of the mould, on which this fertility depended, and consequently that character of excellence is lost; it is vain to repair it with dung, for that manure being lighter than mould, will be washed away yet more easily; and after the advantage of a very few crops, the farmer will find his land has alter-

ed its very nature. The proper conduct, now this condition of the land is known, and the cause known with it, is easy.

If there be choice whether to lay such a sloping piece of ground in tillage or pasture, it should be made pasturage: if on the other hand, the circumstances of the farm require it should be in tillage, let due caution be used.

I have seen in Lincolnshire a safe and effectual method of preserving this ground from being washed away by floods from higher lands. It is by running a firm, but low bank at the head of the land for its whole length, and cutting a ditch for passage of the water close on the other side.

There requires some skill to contrive this properly, but the labour and expence are little, and it is much more than a defence; it becomes an absolute benefit to the land.

The bank need not be more than two foot and a half high; and the earth of the ditch will make it. It should be carried not strait, but if the nature of the ground will allow it, with a little sweep the swelling out a few yards in the centre will give compass enough, and this will prevent the water from the hills beating with its full force against the whole flat surface.

The swell in the middle must be rounded, not brought to an angle; and the rise of the bank must be all the way sloping.

These are the proper cautions against suffering by the fury of the water rushing down in floods. The same force which would have burst through a strait bank, or beat to pieces a perpendicular one, will be thrown off on each side and washed softly up the middle in these rounded and shelving constructions.

The ditch is the next consideration, its depth should equal the height of the bank, and its width at the top the diameter of the bottom of the bank. It must be somewhat narrower and shallower in the middle, and grow deeper and broader by degrees all the way.

At every ten feet there should be laid some pebbles or brickbats through the base of the bank, to give passage for a little of the water while the dangerous quantity is thus carried off; and by this means there will be the advantage of lying under higher land, while all the disadvantage is removed.

This I have seen practised on the edge of the fen countries, and it is of so much benefit to this kind of land, that one cannot but wish it were made universal.

### C H A P. XXXIV.

#### *The Irish method of raising hops on bog ground.*

**T**HE spirit with which the improvement of agriculture is pursued throughout this kingdom, and in Scotland, and Ireland, must give the highest satisfaction to all who wish well to their country, as it promises a vast advantage. The method to make the attempts most useful, is to render them as universal as possible: this the Scotch society have done for their country, by repeating and recommending the discoveries made and published in Ireland; and this we shall attempt by communicating in the same manner whatever is well authenticated as practicable and useful to the English farmer.

The present subject is of a very singular kind, and from its importance deserves the greatest attention. We have given the general management of boggy land in our first volumes, the particular improvements made since in Scotland, and the latest advantages found in England, in the present; but we are here to add an attempt of the boldest kind made in Ireland; and its success which has been such as gives great honour to the inventor.

There is a peculiar kind of boggy land, which from the quantity and colour of the water lodged in it, is called in some places RED-BOGG, and in others FLOW-MOSS. This is the worst of all boggy land, and has been in general given up as incapable of any good produce. In some places it is cut up as a kind of fuel under the name of peat; tho' very inferior to what is properly called so. In those parts, where being more dry, it yields some benefit, this is the least that can possibly arise from land, as it is no mote than the most poor kind of pasturage.

The greatest part of the red bog in Ireland bears no rent, but is thrown into the purchase or lease as unprofitable ground: in general it bears no produce, not even grass, but appears naked, spungy, and raised in hills and holes; and is even useless after burnbaiting, the ashes it yields being small in quantity and insipid.

The improvement of this ground for hops must be begun by draining. To this purpose mark out the quantity intended to be planted, and dig round it a trench two yards and a half wide, and deep enough to drain the ground.



Cut the drains strait, and begin by paring off the upper sods. Cut these no larger than may be easily managed with a pitch fork, and carried off in wheelbarrows: this should be used to fill up holes, and a part of it reserved to face the trenches.

This being removed, the rest of the digging is through a kind of turff which cuts easily; and will pay the labour, as it serves as a kind of fuel.

Leave one or more passages over the trench into the land within: bridges would be expensive, and that charge is easily saved by the natural soil. I gave a piece in two or more places uncut of twelve feet broad, and let the workmen bore a passage through it at a due depth for the discharge of the water.

Bog ground cuts so easily, that all this is done with less trouble than could be conceived: two labourers, one on each side, will easily dig through at a proper depth and breadth till their tools meet, and they will thus form a natural arch, and the substance drying above, there will be a solid passage over for men and carts, and a free course under for the water.

At the lowest part of the trench or drain, where the water is to run off, let a solid bank be made two foot high above the bottom of the trench, and carried strait across it.

This will stop so much of the water as will fill the drain to this depth, and there will be no hurt to the ground, and great benefit several ways.

The advantage is plain, in having water always near the crop to supply it when wanted in dry summers; and there will also be a very valuable manure, for the bottom of the drain will fill by degrees with an excellent and rich mud, which will improve the rest of the soil.

As the draining of bog land, and keeping it dry is one of the first considerations in all such improvements, some may fear that the keeping so much standing water in the bottom of the trench would defeat that purpose, but experience shews otherwise. Water may be detained at a depth without hurting the land, if it have a free course at the top, and that sufficiently beneath the level. Indeed it may be kept nearer the surface than those would think who have not tried; for while the course is free over this head, the quantity that is kept in has no force against the land.

#### C H A P. XXXV.

##### *A provision for poles.*

**A**S the land under consideration in this place is intended for hops, the husbandman should provide in time for poles; and this will be easily done in his own ground. A yard and half within the trench which is carried round the ground, let him open another; this need be only two foot wide and two deep, let it be filled up with soil, and plant in it fallows, and such other water trees as will grow quick, and rise strait for this service. They will be growing while he is preparing the ground, and a proper quantity will be ready by that time he wants them.

Let them be trained up from the beginning to a strait growth, and all side shoots taken off.

When they have stood two years, let the bank be cut at the bottom of the drain, and the water being run off, let the mud be taken up and laid to the roots of the plantation. This will act as a rich and excellent manure for them. They will be supplied with that moisture which is so essential to them, from the gradual draining of the bog; and from time to time afterwards they may be watered with great ease from the drain. The bank is to be made up across its bottom as soon as the mud is cleared away, and water for this and other services will be ready in it as before. Four years from this time will give the fallows, or other trees the due growth for poles; and they may after that be easily so managed as to supply the ground without doing it any injury.

We have, in our account of the hop, given cautions against either exposing the ground too much or choking the plants by trees; this must be carefully observed, for it would be better to bring the poles from a distance than to hurt the plants: but with due consideration, there may always be had a supply of them in this manner, so that they will improve, not hurt the ground. A certain shelter is required for a hop ground, as well as free air, and this is the way to give, both leaving the growth against the dangerous quarters, and clearing it away where the air should come.

#### C H A P. XXXVI.

##### *Of making up a hop ground.*

**T**HE bog being drained, the regular plantation of the hops comes next into consideration; and in this there is considerable difference from the plantation in any other ground: the distances of the hills, according to the gentleman's proposal who invented this improvement, is to be nine foot one from another, and the first row fifteen feet from the edge. Different circumstances may make variations in this respect proper; but as we have not the advantage of experience, we shall by no means alter the original plan: how far it may be reasonable to alter distances, and to make other variations from the strict rule; the farmer may judge by a careful reading of our general account.

The plain and easy way to mark the places of the hills, is by a line in the manner of the gardener's work; first, tie knots in this line at every nine foot, then plant one of the stakes fifteen foot from the inside edge of the ditch made for the fallow plantation: draw the line strait, and put down the other stake at fifteen foot distance from the same ditch at the other end of the ground. This line marks the first row of hills: thrust a sharp pointed stick down at every knot in the line, and thus is marked the place of the first row of hills.

Then remove the line nine foot farther, and mark a second row in the same manner at that distance from the first, and in this method continue through the whole ground.

At every place where a stick is planted, dig a hole a yard in diameter and a yard deep. The upper sods which are dug out, will serve for filling up the hollows in the bog itself; the under stuff may be cut into peats or turfs; and should be carried off the ground to dry, that it may not be in the way of the other work.

These holes are to be filled up with a good soil for the growth of the hop; and the easy method is this. Pare off the turff in a pasture near the bog, and burn it as soon as it is dry enough for that purpose: then scatter these ashes over the surface, and add a little lime and dung well rotted, such as comes from an old cucumber bed is best of all, plow all these well into the ground, and they will make a proper soil for the hops.

There is a necessity of fixing upon a spot near the ground that is to be planted, because the carriage of such a quantity of mould to a distance would be inconvenient and expensive; and if the soil is not good enough in the place thus pitched upon, it will be proper to mix some very rich and mellow garden mould with it.

The hop plants are to be got ready, and the earth thus prepared is to be thrown into the holes. The plantation is to be made in the manner we directed, and the produce will equal that of hops upon any other ground.

The expence of bringing in the mould to fill the holes, is the great article; and there is so much saved in the rest of the work, that this need not be grudged. The person who published the proposal tried it by a long experience before he communicated it to the publick, and none need doubt its success.

#### C H A P. XXXVII.

##### *Of the particular advantages of this method of planting.*

**N**ONE can be blind to the first benefit of this manner of planting, because it recovers into use a kind of land which is given up by the proprietors in all other considerations as useless: but beside its adding as it were so much land to the community, there are particular benefits to the hop itself in this method.

The expence of keeping the land in order is much less than in any other hop ground, and the produce when well managed, has as perfect a flavour as most esteemed in the hop countries.

There is an observation among the planters of hops, that the grounds never thrive unless the whole surface between hill and hill be clear.

For this reason they are at a great expence in paring off the surface; hoeing, weeding, and the like operations. All these are saved in the management of this kind of ground; the red bog keeps itself clear many years from weeds, even when it has been drained, and the surface being bare, reflects the sun beams; that being the great advantage in the opinion of the planters, which the naked surface gives.

There is an advantage in throwing the parings of the surface in common hop grounds, about the stems of the plants; raising by this means the hills, and strengthening the growth.



growth. This cannot be had if it is owned in the bog grounds, but the trouble is saved as well as the advantage lost, and the same labour will bring in fresh soil from the neighbouring pasture, which may be laid upon the hills with more advantage.

Another benefit to this plantation of the hop, is the constant supply of water.

All know how greatly hop grounds suffer in very dry seasons; and there is a great superiority in these, because they can be always, and very easily watered. The drain which goes all round the ground is constantly full to a certain depth, and the water which is easily given the plants from one or other parts of this drain, has nothing of those hurtful qualities which bog water in general is supposed to have; which makes it unfit to promote vegetation. These qualities it gets by lying upon and near the surface of the bog ground: when it is thus received at once from the source into the drain, it has none of them.

No hop grounds are so free from the common accidents as these, which are made from bogs. They are sheltered from storms generally by their low situation: and yet they do not suffer, as others in flat countries do from the rainy seasons, because the spongy substance of the ground naturally lets in the wet freely, and lets it out as freely by the drain; so that nothing of it stagnates about the roots of the hops.

In the common hop ground insects are at certain seasons very mischievous, but we see nothing of this in those made from bogs, they are free when the rest are most infested.

The poles stand very firmly in these hills, for the substance of the bog, when drained, compresses them by its spongy nature, and keeps all together.

The only disadvantage to which these grounds are liable, is the necessity of renewing at certain times the earth in the holes.

The roots of the plants have not any advantage from the intermediate space, which is not of a kind to afford them nourishment. But as a great deal of labour is saved in the culture of this kind of ground; something more than the ordinary share may very well be allowed for the purpose of refreshing those particular spots wherein they grow.

The gardener's method must here be introduced: he refreshes and invigorates his plants in pots by taking off a part of the old mould and supplying the place with fresh, and the very same may be done here. A plant growing in a garden pot is in the same condition with the hops in these holes: it has only a certain quantity of mould for its nourishment, with no advantage from the space beyond those limits: yet these plants grow well; and what is very much to the present purpose, they usually flower better than such as stand in the open ground.

The gardener, to strengthen these, pares off the surface of the mould and puts in fresh: it is easy for the planter in the same way to take off the upper surface of the mould in the holes, and bring fresh in the place.

When more is necessary, the gardener pares away the mould at the sides; or takes up the roots entirely, and filling the pot with fresh earth, plants them in again. These are the various practices of the gardener according to the condition of the plant; and thus the hop planter on the bog may strengthen his plants. He may cut away a part of the mould, near the outer edge of each hole, the whole depth, and taking off that as well as the surface, he may put fresh compost, such as he used at first of pasture mould, lime, and dung in, its place: or he may, in cases of extrem necessity, remove the whole mould out of the holes, and bring in fresh in its place: nor will this be so bad a case as may be imagined. The hops will have afforded him a great many years valuable produce before it comes to this; and he may therefore afford the labour and expence. His ground will be after this, to all intents and purposes, the same as a new one; and there is a very great advantage beside. The bog ground itself, when it has been several years drained and exposed to the air, will by degrees have received their influence and altered its own quality. Instead of being spongy, it will be become in some degree brittle, and the shoots of a few natural weeds of better soils, will shew that it is beginning to take the nature of such land.

The quantity of mould thrown out of the holes will be extremely great: it must be spread over the surface in the intermediate spaces, and it will cover them some inches in thickness.

This will by degrees become rich and vigorous again, for having been exhausted only by the natural growth of plants, it will be perfectly recruited by the fallow: it will be ready

for supplying the place of the surface of the earth in the holes to a great advantage, and that which is taken away may be with equal benefit as the first spread in its place. The mud from the bottom of the drain being taken up at times also, and laid to the roots of the plants, will in its course come upon the surface, and thus the bog will be rendered a fertile piece of ground, not only in the holes where the hops grow, but universally: not fitted for hops alone; but for all kinds of crops.

This is a method of improving bog land, by which it will have all the advantages of common good pasture of tillage ground; and though it takes a long time, this will not be perceived, for the hops will be all that while yielding their valuable produce.

All hop grounds in the common management wear themselves out in a certain time; and must be converted to other uses, while the hops are planted in some other place. In this course of management one piece of boggy land would be drained and improved by them after another, and the publick would receive constant benefit.

#### C H A P. XXXVIII.

##### *Of the use of sea wrack in Scotland.*

WE have named among manures the plant called *Lucus* or sea wrack: it has various names among botanists, and more among farmers; and it is to be distinguished according to its kinds, some being of a more firm, and some of a more spongy nature. In Scotland they use it upon the very worst land near the coast with great advantage, and they would use it elsewhere in the country, if there were convenience of carriage. Mr. Scot has given a practical and useful account of it in the memoirs of the Society of that kingdom, published by Mr. Maxwell, and the Society have added useful hints for farther improvement.

As the husbandry of Scotland and England differ, and even the husbandmen's language in these two kingdoms, we shall explain their meaning to the farmer; and add what late experience has shewn at home.

In Scotland they call this manure *WARE* and *SEA WARE*, and they distinguish into two kinds according to their manner of getting it. These are the *FLOAT WARE* and the *ROCK WARE*, the first is brought on shore by the tide, and they take the opportunity of carrying it to their lands before the next flood washes it away again: the other is native of the rocks, and they may take it off when they please at low water.

The case is the same upon the English coasts, and the difference between the two kinds is so great, that the farmer ought to be thoroughly acquainted with it.

The *rock ware*, or that kind which he pulls from the rocks, is the plant called sea oak or sea wreck, it grows also on pebbles on the coast, and sometimes on shells; this is a tough weed and is impregnated with sea salt: there are also many small insects always living on it. These help the enriching quality; and by means of all together, it becomes an excellent manure.

The *FLOAT WARE* or *FLOAT WRECK* is a mixture of many things. It consists in great part of the beforementioned sea wreck or other sea weeds, which the force of the waves tears from their place of growth; and with these are mixed every kind of refuse matter that is found in the sea; the gelatinous animals, called sea nettles, and the like, many spongy sea plants which are not tough like the wrack, but soft like jelly, and dead bodies of those various creatures which the former naturalists did not know what to make of, and which Linnæus has taught us to call *Zoophytes*.

All these, and many more such substances, are thrown up in high tides, and offered to the farmer on the spot as a manure. With these, in the west of England, they dress their very worst lands, and make them fertile; and with these in Scotland, we hear by the late publications, they enrich their sea coast land, which consists like the heath itself to all appearance, of mere loose pebbles, or of barren sand. They get from both these kinds of miserable soil, considerable crops by its assistance. They are so sensible of its value, that they lament their bad roads and inconveniences of carriage, which deny them the benefit of it in other places.

The value of the manure appears at first sight. What can be more desperate than the condition of absolute sand or a coat of pebbles; yet this the Scotch husbandmen, by this sole assistance, renders fruitful; and the land, which is so situated as to have this advantage, lets for twenty, thirty, or forty shillings the acre, which otherwise would not be worth ten shillings.

With



With us a few miles carriage may be very well worth while for such a dressing; and it is fit the farmer should know the right use of the manure and distinction of the two kinds.

The float wrack is the richest, but it is one of those manures which is to be used for immediate service, not for a lasting improvement of the ground; its particles, though very nourishing, are too light for continuance in the soil; and the sun and air evaporate them in repeated plowings.

Therefore it would be idle to prepare land with this a long time before hand, for its best virtue would be lost: it is not to be used like marle or chalk for mellowing the ground; but like soot, pigeons dung, and the others of the rich light manures, for giving an immediate strength and vigour to the crops.

The best season for laying it on is early in spring, before the rains that may wash it into the ground; and while the sun has not yet too much power.

This is the best season for this kind, when the farmer has his choice, but that is not always the case. As the chance of tides brings it, he must take it when he can get it; and if it is offered in autumn or in winter, it will be very well worth his while to take it up and use it.

In summer alone he cannot make any great advantage from it. The crops are upon the ground, and at such a growth, that he must damage them if he attempt to bring it on; and the sun has so much power, that its virtue would be evaporated, not received into the ground.

The greatest advantage of all that can be received from it, is by plowing it in before the sowing of the spring crops. Let it be scattered regularly over a piece of ground that is to be sown in spring, and plowed in as soon as spread: thus let it lie till the time of sowing. The plowing for that purpose will blend it thoroughly with the ground, and the operations at that time will so mix the soil and the manure, that every part will have its virtue, and the land will be just impregnated with it fully when the seed shoots. The first roots of the young crop will receive its full influence; and the farmer will thus have all its virtue. It will last as long as the crop is growing; and it will be thoroughly exhausted by that time. There will require a new quantity for another crop; but nature gives it him without care or preparation, and he needs not grudge the trouble of spreading and using it.

In some parts of Scotland the farmers call this *INCOME WARE*, from the manner of its being brought on shore: and they always observe that the spring dressing is the great advantage of it. If they meet with it in autumn they use it, but they find its virtue in great part wasted before spring: sometimes they lay it on the seed-fur as they express it: but in this case the good or bad consequence depends upon the succeeding weather. If that be dry there comes more harm than good from it, for the abundant salt being all kept together, burns up the land: but if rains follow, this proves a very advantageous method of using it; for almost the whole is washed in, and the virtue is immediately communicated to the seeds.

These are the chances of this manure, which the farmer can only get when nature throws it in his way; and he is to observe this particular quality of it, that he may judge where and on what occasions to use it.

The lighter the land is the sooner the virtue of this dressing is lost. In the loose, stony, and sandy soils we have proved the advantage is only seen the year when it is used. In those which are a little more firm, they see some good from it a second year: and there are tough loamy grounds, which they call clayey, on which when they have laid on a large quantity of this *INCOME WARE* or *FLOAT WRACK*, they get three crops, and find very plainly the benefit of the manure in them all.

Their crops are bear, oats, and pease and beans, but probably, as the judicious author observes, they might have more advantage by leaving out the oat crop, and depending only on pease and beans, and bear, laying on the *WARE* for every second crop of the pulse.

#### C H A P. XXXIX.

##### *Of the advantage of sea wrack over dung.*

**T**HE farmers who live in the neighbourhood of great towns where dung is made in great abundance, find it so convenient and ready a manure, that they think of no other: but to understand the value of those several kinds we have proposed to be occasionally used, the greater part of which are at least of equal value with dung, they should consider, and compare their several properties as they are laid down here; or as they will hear them related by such as have seen them used; or best of by all those who

have used them. With regard to the present subject the sea wrack manure, wherever it can be had, let it not be rejected for dung, for experience shews that it is better: and even where the land lies at some distance from the sea, it may be worth while to carry it: for in this case the picking up and carriage are the whole expence; and the Scotch farmers, who have tried both, assert that one load of it goes as far as two of dung. Beside the use and manner of applying it which we have named, it would probably be of great use on somewhat firm lands in the summer fallows; but then it must be plowed in immediately.

We name only the probability of this success, because there has not been a fair trial. In Scotland, whence we have most knowledge of this manure, they have no such practice as summer fallowing; and in England, where I have seen this tried lately with no advantage, the soil was sandy, and the manure was suffered to be in heaps three weeks upon the land before it was plowed in; the ill success therefore was owing to the farmer's bad management, not to any defect in the nature of the manure. I saw the whole progress of this trial, and must acknowledge no good nor harm came of it: but if the dressing had been given in a proper manner, there is reason to believe it would have succeeded very well.

The common practice of the Scotch farmers is to use this manure alone; but we have found from experience, that the mixture of many kinds in form of compost gives them great additional force: and there is no reason this should not succeed in the same manner.

The very best method of using it in mixture would be with only pasture mould. It would put this into a state of fermentation, and by that means would more readily impregnate the land when laid upon it.

We have observed that the best time of using this is spring; but nature often denies it, at least does not offer it in any quantity at that time; and on the other hand affords it in vast abundance at seasons when it is less proper to use it.

On these occasions it will be highly advantageous, to mix it with mould into a compost, and thus keep it all the time improving in its qualities till the proper season to lay it on the ground.

Thus suppose in a winter's storm, a great quantity of this *INCOME WARE* is washed on shore. Let the farmer chuse a spot as near the place as he can, but perfectly out of reach of the tides.

Let him pare away the turff, and dig out a quantity of the mould one or two spades depth according to the soil. Let him throw out this mould to the sides of the hole, and lay the turff also ready. Let him lay in one half of the turff bottom upwards in the hole, and throw upon this a third part of the ware. Then let him throw in some of the mould to cover it: over this let him throw in more of the ware, and then more mould; and thus filling up the hole with a coat of one and 2 coat of the other; and throwing in at various times the remainder of the turff, let him make up the whole into a ridge at the top covering it five inches deep with mould.

Thus let it lie till the season comes of using it. The turff will rot, the sea weeds will also be entirely dissolved, and the whole will be a mass of most rich and excellent compost. This may be laid on the land in spring; or at any season when the farmer finds it most requisite and most convenient. In this condition it will mix more freely and perfectly with the soil than in any other; and being itself in a state of fermentation, it will communicate the same quality to the land in a very effectual as well as speedy manner.

#### C H A P. XL.

##### *Of the use of ROCK WARE.*

**W**E have hitherto spoke principally of the *float* or *income ware*, as it is the most valuable for immediate service; but the qualities of the *rock ware* being more lasting in the ground, that also deserves great regard.

As this may be had at any time, the farmer should suit that to the laying it on the ground.

The very best season for this is autumn: the weed itself is in very good condition at that time of the year; and if it be then laid on and plowed in, the ground will be all the winter mellowing with it; and in spring will be fit for sowing with the full strength of this manure in it.

The best method is, just before the autumn plowing, to have a sufficient quantity torn from the rocks. Let it be spread over the ground, and immediately plowed in. The salt which it contains will thus mix with the lower part of the soil; and the weed itself will by degrees decay. Every plowing



plowing will tear it more and more to pieces, and mix it better and better with the mould; till by the spring seed time there will be no large pieces of it left in the ground; and the whole soil will be mellow, rich and fine.

The crops of that year will shew the value of this kind of manure; and according to the quality of the soil it will continue fertile from it two or three years afterwards.

There is another value in this manure, with which the farmer should not be unacquainted, that he may know in what manner to use it, if nature throws it in his way at a time when he has no occasion for it upon his land. This is the good effect it takes in kitchen and fruit gardens.

Experience shews that in these articles it is inferior to few manures if it be to any; and we have told the husbandman, that many of the common products of the garden may be raised with great profit in fields. He knows also that it is his interest to have an orchard; and in both these cases this kind of manure will be very serviceable.

He must have a kitchen garden for his family, and when that article is well managed, and many mouths are to be fed, it is no small consideration: but when we extend the view to the kitchen products raised in fields, it is of great importance.

Whether it be in the field or garden, this *wrack* is to be used, the manner of applying it must be according to the occasion and the nature of the thing itself. We know that the *float ware* gives its virtue most freely, and the *rock ware* is most durable in the soil.

Therefore if a piece of poor ground be dug up for a new kitchen garden, or such a field be plowed with an intent of the like produce, the rock ware must be chosen, and it must be buried in the ground; and afterwards take its chance in the succeeding diggings and plowings to be thrown up again, and mixt with the soil.

It will thus by degrees work among the mould, in some measure as that we directed to be buried for a compost; and the whole body of the soil will become mellow and fertile; and will retain those qualities many years.

On the other hand, if the farmer have a garden crop growing which wants assistance; supposing it to be pease or beans, or other such where there is distance between the rows for digging, the method must be to spread a quantity of the *float wreck* upon the ground in these intervals, and immediately dig it in. The advantage of this will be prodigious, the crop will be double in quantity, and more than twice as good in kind.

In the same manner where there can be the opportunity of giving this dressing to a crop while growing in the field, the benefit will be the same, but this is limited to the horsehoeing husbandry. In the common practice, if the farmer finds his crops decaying during the time of their growth, he can do nothing to help it; but in the horsehoeing method, as there are large intervals, it is easy to strew a quantity of this manure over them, and to plow it in. The advantage will be the very same that is seen in the garden crop: the plants which had appeared faded and yellow will recover their strength and colour, and the corn in the ear will mellow and fill as if the ground had been covered with an expensive dressing at the more regular time.

In orchards the advantage is as great from this dressing as on any other occasion. Mr. Scot, to whom we owe so many excellent instructions relating to the use of this manure, says, that he has seen trees which were perfectly barren, become very fruitful, only by laying a quantity of it about their roots.

This fact, as established upon so good authority, is of great importance in gardening; for there is nothing more difficult than to bring a tree which has become barren into a condition of service.

There may be different ways of using it for this purpose, but the best is to take it in time, and provide for more than the fertility of one season.

If at any time it appear that a tree is likely not to ripen the quantity of fruit that is on it, and which is no more than it might be reasonably expected to afford, the method will be to lay a quantity of the float wreck round the stem of the tree, to cover it with a little mould, and every other day to water it pretty plentifully. The mould which covers it will prevent the sun from exhaling its virtues; and the frequent waterings will wash in its best parts to the roots. Plants are fed by water more than many are aware; and it is a great article at such a time to give them a water richly impregnated.

This method will shew its good effects more than in the year wherein it is done, the two or three succeeding seasons will have some advantage from it: but to go to work in the most perfect manner, the winter should be the time

of laying in the manure, and it should be dug into the ground about the roots of the trees.

For this purpose the best is a mixture of the rock and float wreck, and these should be laid upon a coat of good mould a foot thick, and covered with a foot depth more of the same mould. Thus the whole is to lie in a heap, two or three months. Then the earth should be carefully dug at a distance from the stem of the tree all round, and a good quantity of this manure worked in and covered up with more of the mould. After this three inches thickness of it should be sprinkled over the earth near the stem of the tree, and this should be dug in with a three pronged fork. Thus a lasting fertility will be given.

#### C H A P. XLI.

##### *Of bringing waste land into tillage by potatoes.*

EVERY improvement of husbandry demands our regard from its plain and universal utility; but those articles most of all, which tend to bring waste or neglected land into use; for they in a manner add so much to the kingdom, and the quantity of such land that lies neglected at present in England, calls for all our acknowledgments to those who shall propose methods of rendering it useful.

The method by potatoes is not the least. We owe it to Mr. Wilton, a person of a persuasion which carries with it the character of gravity and truth; and reason countenances what he asserts upon the subject.

The improvement is not limited to any one kind of land; but wet or dry pieces of ground are equally capable of it; so much regard being shewn to their nature as to chuse a proper and suitable kind of potatoe.

In wet ground drains must be cut to carry off the abundant moisture, and they are then brought to the same state in respect of this culture with the others.

In these grounds the first planting must be made with the spade, but afterwards the plow will answer the purpose; and the potatoes, while they afford a valuable crop upon a land almost useless, will all the while be improving it for other purposes: so that after some time it will be brought to the condition of what was naturally richer land; and the proper kinds will thrive very well upon new drained bogs, even where cattle cannot be brought in to plow the ground, because of its softness.

Mr. Wilton, who proposes this improvement, gives a very singular instance of its good success. He tried this management upon a piece of wet ground not worth sixpence an acre, and had tenfold increase two years successively; and the third year without any assistance of manure, the land yielded as good a crop of garden beans as were to be seen any where; and the land after this continued equal to the best in the neighbourhood.

Even in absolute bogs, when drained for this purpose, the planting and management of the potatoe so perfectly divides and improves the soil, that it will bear grain and grass very well, and in the end become good meadow land.

The frequent digging that is necessary in raising this kind of crop is a vast advantage to the ground; and the haulm of the potatoes, which is large and plentiful, rotting in the land, adds the benefit of a manure. The roots themselves raise and mellow the earth; and notwithstanding their large size, and great increase, they exhaust it very little.

There are two kinds of potatoe which thrive best in boggy grounds, one the long, white, and the other what is called the blue potatoe; and these are both very good kinds. Mr. Maxwell observes, that when a piece of heath ground is once prepared for these, three crops of potatoes, and three of grain may be had from it without more charge than the common labour.

The third year's fallowing may be saved by planting of potatoes with the plow; and no crop lost. The same quantity of dung in this case answers the purpose, and the year's produce of potatoes will be more valuable than if corn had been sown; and the ground improved more than by a fallow. These are considerations of a large extent, and may be the source of a great deal of advantage, under proper management, not only to the husbandman who puts them in practice, but to the kingdom.

#### C H A P. XLII.

##### *Of burning the turfs on wet and waste land.*

THE advantage of burning the turf or surface of the ground in barren land is known sufficiently, and we have in treating of this article under the head of burnbaiting, given the methods by which the common disadvantage attending



attending this practice may be removed. This ill consequence is the exhausting of the ground in a very peculiar manner after certain crops; but it may be prevented by timely assistance from manures.

The inconvenience and difficulty of burning the stuff, occasions many to neglect this useful practice; but there is an improvement upon the common method of doing it in the memoirs of the Scotch society, which may deserve attention.

The superficial coat of the earth is the proper subject for this burning, and in whatever manner or on whatever occasion it has been taken off, the same method may be used in reducing it by fire to a proper condition for manure.

Usually this is done upon the spot, and there is certainly great advantage in that: and in what is called burnbaiting, the upper coat of the ground is pared off for that purpose. But when any accident offers the coat of some part of the ground for this service, it should never be neglected. In digging ditches or ponds, the first spade's depth will excellently answer the end; and when ant-hills or mole-hills covered with grass come in the way, they should always be employed for the same service. Whichever of these things is to be burnt, first let it be well dried: then dig four channels half a foot deep, and of the same breadth, and let them be thirty foot long. They must intersect one another in the middle, and there let them join.

These channels should be covered over with bricks or tiles all the way, except in the middle where they join.

In this part it will be proper to erect a chimney made of four bricks, and continued up to the height of nine foot.

As this will be a very tottering building, let it be supported by a parcel of turfs laid all round it up to the height of eight foot. Round about this turf set five and twenty good faggots upright; and lay upon these a little cord wood.

This must not reach so high as the top of the chimney.

From these faggots piled round the tufting of the chimney lay four others, one upon each of the channels; and in the same course with the channels.

This being done, bring in a good quantity of the turf, and lay it upon and about the faggots which lie lengthwise on the flues till they are covered; and heap up more till the cord wood is covered two foot thick.

When the heap is thus raised, care must be taken to stop up all holes and crevices that shall be seen in it: for the fire is not to have any vent except at the chimney. Nothing more is required for stopping these but to lay on pieces of fresh turf; but this must be done with care wherever there is occasion.

The heap being thus prepared and finished, the faggots on the flues or channels are to be set on fire, at that part where the wind will best carry the flame through the whole.

Therefore, whichever way the wind sits, let the fire be given in that flue which faces it: but let all the rest be kept open and clear to assist the draught of air.

The fire must be watched during the whole day, that it keeps within bounds; and that it have proper matter thrown upon it.

In half an hour the top of the heap will begin to sink; and the fire will burst through many cracks made by that shrinking; but this must be prevented by laying on fresh turfs, and making up the heap; and at the same time clapping on some any where that the fire shews itself through the sides.

The quantity will diminish very fast, and from time to time it must be supplied; till all is thrown on.

This will extend it in circumference at the bottom; and as it spreads beyond that part of the channels that is covered, they must be covered farther; for this keeps up the draught of air. The chimney must also be kept all the time a foot above the heap.

If the matter burns more fiercely at the top than elsewhere, as is often the case, some openings must be made in the sides near the bottom: when it burns least in any particular part, stop up the channel that is nearest that part, and let it remain so till it be as well on fire there as any where else, and then open it again.

If the weather be tolerably favourable, the whole quantity of turf will in this manner be burnt to a fine, rich, and strongly saline ash: but if violent rains fall, there must be all possible care taken to preserve the calcining matter; as well as to keep the fire burning. The best method is to pile on fresh turf in so large a quantity, as to keep out the wet; and to repeat and renew this as the fire within burns it away underneath.

By this means a vast quantity of turf will be burnt in a small time; and if there be a demand for more than

usual, two or three such heaps as these may be made up at once, and one person can attend them. The ashes they produce are an excellent manure; and experience shews, that when these ashes are made by burning such great quantities together, they are stronger and better than those made in the common way of burnbaiting, by piling up the stuff in little heaps.

It is equally excellent as a manure for corn and pasture ground. When it is used for land in tillage, the proper time of laying it on is just before the last plowing up of the ground for seed: on pasture ground it may either be laid on in autumn or spring; but the best time is in spring a little before the first shooting of the grass; in this case its advantage is equally seen in the present and the succeeding years; and beside the first great shew of success it is very lasting.

The way of laying it on pasture ground is to spread it from the cart; a person standing in the cart with a shovel for that purpose. When it is thus laid tolerably even, the lumps must be broke by a labourer going over the ground with a spade, and after this it must be rolled twice over with a heavy roller.

The rains that follow will wash it perfectly into the ground, and it will at the same time prevent the growth of moss, which is the worst enemy to grass land, and promote that of grass; and particularly of the white clover. The quantity at a medium should be sixty loads to an acre.

### C H A P. XLIII.

#### *Of flax.*

THE perfection of the seed of flax is a great article, and it appears from the observations of a curious person on the spot in Holland, that it is not the common loose soil of that country which produces fine seed from the plant, but the stiff and clayey soils, which they till with a particular care and labour for this purpose, in some peculiar places. The Dublin society first published these observations, and they deserve to be commemorated in all succeeding instructions for husbandry.

In the province of Zealand they raise flax seed to perfection, and not in the common loose land of Holland. The Dutch supply great part of Europe with this seed; and as they know the trade depends upon their fidelity in selling only what is good, they never offer any at market but what is the produce of these soils at home; or what is first imported by them from other kingdoms where a seed of like quality is produced; probably by the same means, it having grown on a well cultivated soil of that strong kind.

These firm and tough soils not only produce the most perfect seed of flax, but when sown for the common produce of the stalks, they afford them larger, and more in quantity than the light and dry lands: but the flax is somewhat inferior in quality.

The farmer who intends to raise flax, will therefore consider the nature of his ground, and the demand for the commodity, and he will sow accordingly; for very fine flax upon light ground, and for perfect seed upon stiff soils; for the stalk upon such land as is dry, and for the seed upon such as has more moisture. But in all this there must be discretion: absolute wet clay will not answer the purpose for seed; nor will poor and barren sandy land yield crops of the stalk worth gathering. There is a medium to be regarded in all things, and no success can be expected without it. The firm lands are fittest for one of these purposes, and the light for the other, but there are degrees in the composition of soils: and for the purpose of seed a very firm loam is better than absolute clay; as for the common growth a land somewhat lighter than this, but not approaching to absolute sand.

The more tough the soil is, the more working it will require; and he who spares this will defraud himself ten fold. With regard to manures the Dutch use principally three, horse dung, ashes, and human excrements. This last is a very offensive article; but in the dressing land for a produce that is not for food, it may be allowed; and in some small trials which have been made in England, it has been found excellent. There have been farmers who have used it for corn land; but the thought is most detestable. The use of it, if limited to crops not intended for food, may be well worth consideration; and for this plant and for hemp it will answer excellently.

The quantity that may be had is very great, and at present it is worse than useless to the publick. There is an expence in carrying it away, and wherever it is laid it is offensive. In this case it would be converted to a very useful substance, and there is none who doubts its richness when properly used.



The methods which have been proposed by others have not answered to expectation: for the way in which it is least offensive, and best conveys its virtue to the soil, is mixing it first with earth and ashes. This is the method wherein it has succeeded in the trials made in England; and there is no reason to doubt, but it will in the same manner answer in larger works. The success of the Dutch, who we are assured by the observations before mentioned, use this manure, should encourage us to the trial, and the husbandman will find few crops more profitable.

## C H A P. XLIV.

*The method of using human excrement as a manure for flax.*

**D**IG a pit in the ground three foot deep, and thirty foot broad, in length proportioned to the quantity of the manure that is wanted, or that can be obtained. Mix together one load of common coal ashes, and three of mould, from a dry and sharp loamy pasture: if the earth of the place be of that kind it will save trouble, because the pit may be only dug two foot deep, and then its bottom broke up, and the mould well divided for a foot depth more. In this case the ashes should be spread carefully over the surface when the pit is cleared out to two foot depth; otherwise such a quantity of the mixture made of three parts mould and one part ashes, must be provided as will cover the bottom of the pit a foot deep. There is a necessity of the mould being loamy, that is, that it must contain some clay and some sand as well as vegetable earth, that the excrement may be well divided and fermented with it.

When this is ready, bring in a quantity of excrement from the emptying of common bog houses, equal to the mould and ashes; and let it run in among that loose matter. As it will naturally be brought in carts, the best way is to order it to be turned in at different parts of the pit. Let it be covered with a light coat of the same kind of mould: three or four inches thickness is sufficient. This will be moistened by the matter underneath, and with the heat of the sun will dry into a kind of crust. When the whole is so far hardened that it can be dug up, let this be done with care. Let it be turned and well broke with the spade, and after lying a little time longer covered with a fresh crust of mould, it will be in perfect condition to throw upon the land before the last plowing. This must be done regularly, and a labourer must follow the cart to spread it well, and then the sooner it is plowed in the better. The seed being sown soon after this, will fall into the soil at the time when it is most influenced by this manure, and is in a good condition to receive it. The fermentation which is thus made in the ground, will continue during the first growth of the plants in great strength, and it will only be less as it is less wanted.

The stiff soil, which is most profitable for flax, will be rendered warm by this manure, and its natural coldness being conquered by this dressing, while its proper firmness for holding the roots remains, both the stalk and the seed will ripen in perfection.

This is an assistance, by means of which the flax of Britain may be brought to rival that of all the kingdoms in the earth; for there is none better calculated by nature for its production.

## C H A P. XLV.

*Of other manures for flax.*

**A**S the soil will, from its nature, suit the other principal manures, as lime and marle, these may be used. With regard to common dung, it should never be laid on till well rotted; and it is much better in compost, than any other way. The sea wrack is also a very good manure for flax land; and in general, any thing that has a small quantity of sea salt in it. When a dry and hard manure is wanting, as in case of too damp a soil, as well as too tough, that sort of sea sand which is made up of fragments of shells, is very proper. Dung should be avoided, where other manures can be procured; because every one knows that dunged lands are more subject to weeds than others; and there is no crop that suffers more by weeds than flax. They not only exhaust its nourishment, but keep it from the free access of the air on all parts, on which depends, in a very great measure, the perfection, toughness, and colour of the threads.

The fineness of the soil is the next consideration; and this is so essential, that in Zealand they raise flax after successive crops of corn and madder; in the preparation for which crops, and management of the last while growing, the soil is sure to be brought into an excellent degree of fineness. This is a most essential article; that with com-

mon refreshments of manures, they find such land support the crop of flax, even after all this waste of nourishment, better than the freshest soil usually would, if less reduced by tillage. The nature of the land they employ for this service, also makes long tillage more than ordinarily needful; for it is of the clayey kind, as we have observed before, and subject to wet. Now there is no soil so stubborn as clay: nor is that ever so perfectly so, as when it is wet withal. The digging for the madder gives a kind of tillage, that field land rarely has on any other occasion; and this perfects what the dressing for corn had begun: our farmers know the advantage of bringing in one crop after another, upon many occasions; but there is none in which it answers so well as this.

If the land be not very well in heart at the beginning of this course, it is impossible the whole should be well supported; but the field being brought into a condition suited to the expectation of the number of crops, and kept up in it by good dressing during their growth, becomes thus a source of great and repeated advantage to the husbandman.

Indeed as flax naturally and happily follows madder, it were extremely to be wished, that in England our farmers would see the proposal in its full extent, and undertake both together. There is no doubt of our being able to propagate madder as well as flax; and that with the same attention and industry, we may do it as well in England, as we see it done in Flanders. The spirit of improvement is on foot, and this root is one of the articles which is proposed for an instance: the second consideration of raising flax after it, is by no means to be slighted; and there will be no danger of success, if the proper methods are followed.

There is no way by which madder can be brought to so great perfection, as by the horseshoeing husbandry; and in this method there is no danger of over draining the ground. The intervals of the plantation which are from time to time plowed up, are thus kept in a state of fallow; and when the madder is taken out of the ground, the soil will be in an excellent condition to prepare for flax; not only because the intervals which form the great part will be unexhausted, but the whole soil will be broken, and reduced to that fineness which the flax requires, much better than by any other way of dressing.

If the farmer will attend rightly to this method, and undertake it with spirit and discretion, his success is certain; and the advantage will be much greater than can be obtained any other way. The same tough soil when duly prepared, is excellent for wheat as well as flax; and some tillage that will be useful to the one purpose, prepares it also for the other.

We recommend the horseshoeing husbandry; but we do not, in the manner of Mr. Tull, advise the farmer to depend upon that only, and to exclude all manure.

When he has pitched upon a proper field, let him enrich it, by a moderate addition of such manures as we have directed; and though we advise some, let him not suppose we direct him to lay on as much, as if only the common tillage were to follow. The horseshoeing method will make less answer; but that smaller quantity should not be denied.

When the ground is thus brought into a condition for the long service it is to do him, let the wheat be sown by the drill plow in October, and the crop assisted by frequent tillage of the intervals, till the time when the corn is full in the ear.

Thus will the soil be very well broke; and the wheat crop being taken off, let a second be raised, by drilling in the centre of the intervals. This will succeed as the first; and thus no time will be lost, for it may be sown as soon as the harvest is in. These intervals having been, all the time the other crop was growing, kept in a continual state of tillage.

The places where the rows of wheat stood, will now be the intervals: they must be wrought by the horseshoe in the same manner as the others were: the crop will be thus supported, as the first; and when it is taken off, the ground will be all of it in a state of thorough tillage, the different parts having been well wrought in these successive growths.

A slight addition of manure will now prepare it for the madder; and that crop being in the same manner planted at distances for horseshoeing, the same consequence will follow, that all the while it is taking its growth, the greater part of the land, that is, the whole extent of the intervals will be preparing for the flax by the repeated plowings.

The madder being taken up, the flax should come on with another slight addition of manure; and thus all the crops will be well supported, and after the last of them, the ground will be in a condition to be very easily refreshed by new dressing, for the reception of the same things in course again; or of different crops.



In those parts of Flanders where they do not deal in madder, they allow a very fine dressing for the land intended for their flax: they give it the advantage of a summer fallow; and for preparing it to receive the seed, they allow three plowings. The time and labour they bestow on this crop is very well repaid, by the abundance and excellence of the commodity. This is a lesson we have often attempted to inculcate into the English farmer; and he may depend upon its success. There is indeed no bounds that need be set to the assistance it is possible to give a crop: for there is no expence it will not repay. We do not speak of flax alone, but of all kinds of the farmer's plantation. The same piece of ground with better management will produce richer and richer crops, almost without limitation; and half the ill success our people meet with in their attempts to raise crops which succeed so well with their neighbours, is owing to their not allowing the same care and labour.

It is common to sow flax in Ireland upon one plowing on ley grounds; and it is no wonder the return is but moderate. We have said, that flax seed requires a soil perfectly well broke and tilled; and the moderate crops of it produced on land so imperfectly prepared for the seed, are proofs that the same ground, with due tillage, would have yielded very fine ones. This is the great consideration in all new subjects: we allow them less care than the old; and by this means we get inferior crops: reason dictates a conduct exactly contrary, and by obeying her, we should reap the proper advantages.

#### C H A P. XLVI.

##### *Of the Flemish management of their wet clay.*

THE Flemish husbandry, with regard to the growth of flax, cannot be too exactly copied in England: for it is owing to their management of the land, not to any thing in the land itself, that they obtain those excellent crops of flax, which make them the envy of their neighbours. Their land in general, on which they raise this plant so successfully, is tough and clayey, and is too much subject to moisture. They manage this in a way we should, on many occasions, be very wise to copy. They lay it out in broad ridges, sixty feet or more in breadth, and they separate these by trenches of two or three feet deep, and half a yard wide, according to the nature of the soil. This serves at once to drain off superfluous wet, and to keep as much as is necessary for the good growth of the crop. The breadth of the land preventing its drying too soon, and the depth of the trenches taking off all redundancy of moisture.

Flax never succeeds, unless there be a due quantity of moisture detained about its roots. It is for this reason principally, that tough soils raise the strongest crops of this plant, because they always detain some wet: and the Flemish husbandmen so well understand the necessity of this, that whenever they sow fields of a lighter soil with flax, they lay the whole ground flat and level, and make no trenches, that all the wet which falls may be received upon the surface, and detained there, without passage out by these trenches, which in too wet land serve absolutely as so many drains.

The seed for a crop of flax cannot be too carefully examined. The methods of the Dutch by which they judge of the seed, should be carefully observed also by the English farmer. In order to examine the thickness of the seed, let the farmer take up a handful and squeeze it: there will be numbers of the seeds force themselves out between his fingers edgeways; and it is by the edges the thickness of the seed is to be examined: if these be sharp and thin, the seed is also thin and poor: if they be rounded and plump, the whole seed is of the same quality. They must also be firm and smooth; for if the edges of the flax seed be rough, ragged, or broken, the seed is damaged; so much of the success of the crop depends upon the perfection of the seed, that too much care cannot be taken in this and the other methods of examination.

If the seed answer in this point, throw a parcel of it into some water: the sooner it sinks the better it is. This is a true and certain way of judging of the weight; and no flax seed can be good, that is not heavy.

Another quality of the seed is, that it should be very oily. When flax seed is in perfection, it burns brightly and violently in the fire, and crackles all the time. When it is poor, it consumes in the manner of chaff. This furnishes the Flemish husbandman with another method of judging of the seed; he never fails to try it by all these, by his touch, and by his eye; by water, and by fire: and if it answers to all, he is secure. If there be any doubt, he sows some of it on a hot bed, and by this learns at once in what degree it possesses the power of vegetation. In all these trials there is very little trouble; and if there were much

more, it would be very well worth the while, in order to avoid so great a disappointment as the loss of a crop, by the irreparable fault in the seed.

If this caution be necessary to the people who constantly deal in flax, and are by long custom acquainted with all the particulars of the seed by sight, it must be much more needful to us, who have not yet that acquaintance with it.

The change of seed which we have had occasion to recommend on many other occasions, is in no article more necessary, than with regard to flax; and the great benefit will depend upon the farmer's changing with some distant acquaintance, whose crop of flax has stood upon a piece of ground, in some measure different from his own; and in a different situation and aspect. The thing is not so well understood as it is known, that all crops succeed the better for the seed being brought from a different ground: and it is plainly so in flax. No soil, which has not a sufficient firmness, can raise the flax to a state of perfection: therefore no other can produce good seed. This is to be the farmer's first object, in the procuring seed by exchange; but he will find that so long as there be a due toughness in the soil, where the plant has grown, the seed will succeed best on clay, that has been raised upon a loam, and that will do best on loam which has been raised on clay: and as the situation and aspect of fields where flax is sown, is an article not at all regarded, he may easily obtain the seed from a field open to a different quarter of the heavens from his own, and probably this will be a great advantage. I say probably, for the fact has not, that I know, been tried in this instance; but what succeeds in one plant, is likely to have the same effect on others: and I have found in gardening, that the obtaining seed from a piece of ground, with a different aspect, has been of great benefit.

The change of seeds is an article of more consequence than is imagined, in the raising of flowers to their highest perfection; and this particular promotes it greatly. The field is only a garden of more extent; and whatever is useful in one, will be so in another instance. The more the culture of the field is brought to be like that of the garden, the more it will give strength and perfection to the crop.

The more difference there is between the soil, situation, and other circumstances of the land where the flax grew which produced the seed, and that whereon it is sown, supposing both to be within the limits of what we have described as proper soil for this plant, the more expectation there may naturally be indulged that the crop will be good; therefore the obtaining the seed from other parts of the same country, is preferable to the common method of procuring it from abroad; because, in this case, the farmer can be sure that he has it from a land of contrary qualities, thus far from his own, which he cannot possibly know, when he has it from abroad.

The lighter the soil is, the more apt is the flax seed to degenerate; but it has been proved by fair trials in Ireland, that when this seed has been reduced to a very poor state, by sowing year after year on light land; it will recover greatly on being sown on clayey soils. We have said, that these require great tillage, without that they are perfectly unfit; but under the management we have directed, they will afford a large crop of flax, and perfect the seed.

The purposes of the farmer who raises flax are two: the obtaining the immediate and intended produce of the stalk, and the seed. These may be considered separately, in regard to the quantity of seed to be sown; for, in general, the fewer the plants the better will be the seed: therefore, where this is a material consideration, care should be taken accordingly; and this is a very essential article, while we are endeavouring to raise our own seed to such perfection, as not to need foreign purchase.

The time of sowing is a great article in respect of the future working of the stalks. There requires summer weather for the doing this well; and the earlier in spring the seed is put into the ground, the more chance there is of this advantage; for so much the sooner the flax will be ripe.

There is also this farther benefit to the farmer, that when he gets his flax crop early off the ground, he may have a crop of turneps directly after it. There is a great deal of difference between making this second profit of the ground and letting it lie idle: and experience shews that turneps thrive very well after flax; and the getting two crops instead of one, is an advantage of no mean consideration.

Another very useful crop there is which succeeds extremely well with flax: this is clover. The farmer who intends to lay down his land after the crop of flax, cannot do better than by sowing clover a few days after the flax is in the ground. They grow together without the least prejudice



judice to each other; and by that time the flax is in a condition to be pulled, the clover will be of great strength and a fine appearance.

The flax is so far from receiving any damage from this, that on the contrary the clover seems an advantage to it. It is not difficult to explain this: there are many plants which grow naturally in pastures, which no art can raise in gardens; and the reason is, that the grass is a shelter to their roots, and by its continual shade mellows the ground, as well as keeps it moist by detaining the dews. Clover does something like this, and flax is one of those plants which naturally receive advantage from it. In this case the two crops take their growth together, and one is ready for service when the other is removed out of the ground. The clover also prevents those tall weeds which are found so detrimental to crops of flax.

When flax and clover are sown together, the article of weeding is saved, because these crops will suffer no weed to live among them: in other cases the field must be carefully weeded. This is best done when the flax is about a finger's length out of the ground; and the weeders must take care not to tread the young crop into the ground: for the plants rarely recover this. The weeding without shoes has been found a great article of security to the crop: the Irish as well as Dutch, have found, that if the weeders sat down upon the flax, the plants recovered the bruising; but not if they were trampled into the ground by the heels of their shoes. The going without shoes takes off the danger, for the soft and flat foot does as little harm as the sitting upon the plants.

This must be done with caution on the part of the weeders not to endanger their own health. People used to the inclemencies of the seasons in their course of employment suffer less from them than such as are bred more delicately; but there are outrages upon the constitution which affect all. The proper persons for weeding without shoes are those who have accustomed themselves to go without them on other occasions; and Ireland affords many such, nor are they wanting in some parts of England.

#### C H A P. XLVII.

##### *Of the time of pulling flax.*

**T**HERE is no article of so great importance in a crop whose value depends upon the strength of the fibres in the stalk, as the time of gathering it: this is very much misunderstood, and there are those who run into extremes on each side. The Irish often pull it too soon; and notwithstanding the high opinion we entertain of the Flemish husbandry in this respect, they usually let it stand too long.

The farmer should understand something of the course of vegetation, to be a true judge in this respect.

All plants, when they have perfected their seed, die down to the ground; and the annuals entirely. Flax is of this latter number, and when the plant has perfected its seed, the root decays, and consequently the stalk dries.

If flax were left upon the ground till it were come to this condition, the fibres of the stalk, which are its valuable part, and make the threads of linnen, would be spoiled; therefore it is to be pulled before that time, in order that the threads may be tough.

The plain doctrine is, that they are tough while they have some juice in them; and rotten, or at least brittle when they have stood upon the ground till all the juice is evaporated. That being a kind of careless curing by the air, in the place of that regular and delicate manner in which the farmer is to prepare them for service.

Therefore it is plain that if they be left so long upon the ground they get great damage; on the contrary, if they be pulled up too soon, these fibres have not their due strength and value. There is a time when they are perfected by nature, and that the husbandman should learn, and should seize for his service; for all things, when they have attained perfection, begin to decay.

While the stalk of flax is full of juice, the fibres are too soft for their intended service; and when the plant is gathered at that time, they break in the working, and there is great waste. Therefore the plants must stand longer than this period. There is a time when very little more juice is sent up through the stalk, which is when the seeds in the heads have attained their bigness, and want only hardening: it is then the flax should be pulled. It may be known by the condition we have just named in the seeds; as also by examining the fibres themselves in the stalk, for they are weak and watery when the plant is too young for pulling; and they are dry and brittle when it has overstood the time. While the stalk is full of juice, these fibres

cannot attain any firmness because of the moisture: when the juice has utterly ceased rising, they are dried up by the winds and sun, and by that means lose their toughness. There is a period between the two, and no other is proper for pulling the flax. The juice of the plant does not at once cease to flow, but by slow degrees. As the seeds acquire perfection, less and less is sent up from the root; and it is in this state that the fibres in the stalk gradually harden. Before it is entirely stopped the plant should be gathered, because when it ceases altogether the sun and air act too forcibly upon the stalk: while any sap rises, these fibres are not exposed as dry threads to its influence; and before it ceases utterly, the plant must be pulled up: for these fibres are then in a condition to bear the management by which they are to be prepared for the manufacture, with the greatest advantage.

When the crop is left too long upon the ground, the rind of the stalk cracks, and the fibres are exposed to the sun and wind, which drying them up too hastily, destroy them. On the contrary, when they are gathered too soon no care in the succeeding management can render them tough as they ought to be. There is in each case also a loss of the seed, for when the crop is pulled too early, no curing can make the seed perfect; and when it is left too long upon the ground, the pods burst open, and between the field and the floor a great deal of the best seed is lost. The Dutch find a rule for gathering their flax in the colour of the stalks; when they appear of a pale and strawey hue, they know it is time to pull them. But in England this is no certain rule, for according to the soil and seasons they grow pale and yellowish sooner or later in respect of their real maturity. When the flax is pulled it must be gathered up into small heaps with the heads all laid one way; and it is best to lay them to the south, that the noon day sun may have its full influence upon them. They must be turned occasionally till they are regularly and equally hardened; and then carried off the ground. The time for this is uncertain: in very favourable weather a fortnight answers the purpose, in worse it is the business of three weeks.

It has been a practice in some places to stack the flax as soon as it is in a condition, without so much as getting out the seed; and it has been pretended by the advocates for this method, that the stalk and the seed both received advantage from this. The threads of the stalk growing more tough, and the seed getting a greater degree of hardness on the surface by which it was preserved from injuries; but it does not appear from trial that either of these benefits arise from the method, and there are certain disadvantages attending it, for the seed will in part shed and be lost, and the stalks will be hurt by vermin, which find at once food and shelter in the stacks. Ingenious methods have been devised of destroying these, but unless some good can be shewn to arise from the practice, it will be better to omit the occasion of the mischief than to seek a remedy.

#### C H A P. XLVIII.

##### *Of the preparation of the land for flax seed.*

**A**S clayey soils, and those of the like nature are the best with proper management for raising this valuable crop, the farmer should attend to all the general rules for their improvement, which we have given when treating on that subject in the preceding volumes; and after the addition of proper manures, the throwing up the land in ridges in winter will be of excellent service.

The more clayey grounds are exposed to the frost, winds and air, the more fertile they become; and in this case the laying them out into broad lands afterwards at the time of sowing, will give the whole superficial part of the ground another breaking of the parts, which will be greatly useful.

If the tough soil to be dressed for flax lies upon the descent of a hill, the common method would do harm, for if the deep trenches we have directed were made straight down the hill, the water in violent rains would wash down all the rich part of the ground with it. To prevent this, the furrows should be laid crosswise of the hill, and the same kind of lands laid out as in the former direction. Then there should be opened two deep trenches one on each side of the ground. These are to run lengthwise, and the use of them is to discharge the super-abundant moisture from the trenches between the lands. Thus the wet in the hard rains of winter will not run straight off as in the other method, but will be detained against the next ridges: what fine mould is washed out of the first, will be received into the second and not lost; and the first ridge from which it came will not be impoverished, for it will have received as much



from the higher grounds. All this time the trenches between the lands opening into the two which run lengthwise at the two ends, there can no wet lodge in them to the detriment of the ground. The husbandman may contrive this so as to suit his advantage; for according to the depth at which the furrows between the lands open into the trenches at the sides, the whole quantity of moisture will be drained away, or only so much of it as is found superfluous. This is a general method of managing ground which is kept in tillage on the sides of hills; and we see it with pleasure adopted by the Irish, who read with discretion. The directions at large suited to all kinds which lie in this manner, may be found in the preceding volumes: we treat here particularly of this clayey soil as to be dressed for flax.

When the ground is thus prepared for the crop, its condition should be well examined in the respect of richness; for on that must depend the quantity of seed allowed to the ground. If land be very rich, and the seed sown thick, the crop will probably be beat down, and lodged by rains before it is half ripe; and there is no crop whatsoever which would suffer more by such an accident than this. The timely care of the husbandman must prevent that mischief, which if it happen no art can remedy. He is to sow sparingly. The crop in this case will be able to support itself; and the quantity will yet be very great. For although there be fewer stalks upon the field, every one of these will be thicker and better nourished, and will yield more and better thread.

There is also a plain advantage behind, namely, that the land being less exhausted will be the more ready for another crop.

We have spoke before of the advantage of sowing clover with flax. There is no instance in which this conduct is more proper than the present: for a larger quantity of seed may be allowed to rich land when clover is to be sown with it, than where it is not: the clover keeping the ground moist, gives better hold to the small fibres of the root; and the stalk of the flax being supported at the bottom, will be in the less danger all the way up.

If we observe the stalks of plants which are blown down by the winds or lodged by rain, we shall plainly enough perceive the reason of this. The weak part of the stalk is just between earth and air, just where it rises out of the ground; and this gives way either bending or cracking with the weight of rains, or by the force of winds: this is supported by the clover growing about it, and surrounding it to six inches height; and it is able from this support to bear the weight of rain, or stand against the force of wind much better than it otherwise could. When the flax stands thick, it may be lodged by means of the weakness of the stalk in any part; and this will naturally enough be occasioned by the plants choking one another, and standing so close, that every stalk is as it were drawn up and weakened. The free access of the air dries it; and gives it the needful hardness.

This is a consideration which extends farther than to the immediate danger of the crop's lodging; for the very substance of the stalk is never perfect unless it have this free admission of the air; and though the crop stand up very well when it rises thick, as it may do in still and dry seasons, yet the threads of the stalk will be weak and poor, that is, the great crop will produce bad flax for the manufacturer, and a third part of the quantity might be worth more money.

This is a caution of great importance, and the lesson is a very plain one that the farmer has from it. It is that a flax crop should never be sown so thick as to shut out the air from freely blowing upon the stalks, and from an easy passage between plant and plant.

This gives a natural and certain preference in favour of flax crops, to the grounds we have been mentioning on the sides of hills above those which are flat.

It is not to be denied that the best flax in the world is produced upon flat grounds; for the province of Zealand, where the culture is most understood, is of this kind. But it is as certain that if the same persons had the management of flax upon grounds which had some ascent, they would produce yet finer crops of it.

The reason of their success is not that the situation is advantageous, but only that they understand the culture of the plant. Their land has the advantage of firmness, and this is in their favour; but the level situation is against them in more respects than one; it not only subjects the crop to want of air, and a free thorough passage of wind, but the wet is naturally too much, and their trenches between the lands, though an excellent method, do not always remedy that inconvenience.

We have vast choice of soil and situation in this kingdom; and it is certain if the Zealand husbandmen had our land, they would be more eminent than they are in raising this plant.

The most advantageous piece of ground of all others would be one which had the proper soil, and which rose gently in the middle, falling off in an easy descent each way. Such may be found in many parts of the kingdom; and beside the common benefit of the soil, it would yield a larger and better crop of flax than any other, because the seed might be sown thicker, and the plants would still have the free air and sun: these are as requisite to give a consistence to the fibres, as a sound and good soil is to nourish the plants; and the seed would have the same advantage with the stalk, in these places: it would ripen better than in a less airy situation. By changing the seed from one of these grounds to another, we should obtain much better at home than we at present import from abroad. The Flemings or Zealanders have no advantage over us in this respect, and yet they have better seed of their own produce than any they import from abroad.

There is also a particular and forcible reason why we should, if possible, ripen good seed at home, for we can be sure of its being fresh when we sow it; which, though it may be guessed from the appearances we have named, can never be certainly known in regard to any that is brought from abroad.

Flax seed will grow when it has been kept some time, but it will not grow with the proper vigour. The strength of the plants is an article of vast consideration in flax crops; and we have seen by experiments, that there is great difference between plants raised on the same ground from seed of the last season's growth, and that which has been kept longer. The new seed shoots two or three days sooner than the old, and the first shoot is stronger and more vigorous. This original distinction is preserved through the whole succeeding growth of the plant; and the preference is so great as to deserve the most careful attention.

The soil on which flax is sown must have some influence in directing the time of pulling it. We have observed that the exact period for doing this, is when the fibres of the stalk have just begun to harden, which is the time of growth when the seed has its full maturity in dimensions, and begins to acquire that firmness in the rind which is to be its defence against accidents. The root at this period begins to send up less juices, and the fibres which had their due growth before, having now less moisture naturally harden. This is the course, and this the time of the change when the flax grows in sound and firm soils, which detain, even in the heats of summer, some moisture, and which defend the roots by their firm covering from the heat of the sun. The stalks at the period just named change colour; and there is that obvious notice for the husbandman, that the time of pulling the flax approaches, beside what he finds in the condition of the seed.

But in crops of flax, which grow upon light and loose soils, this drying up of the juices is too hasty, and the change of colour comes on before the seeds have attained this degree of maturity. This is called by the flax husbandmen the *firing* of the crop. In this case the flax must be pulled, though neither the seeds nor the fibres of the stalk have acquired their due maturity: for if it be suffered to remain longer on the land, the stalks dry up in the irregular manner we have before-mentioned; and the flax, when it comes to be dressed, is dry, brittle and harsh; a great deal is wasted in the working up, and the remainder comes but to a poor account, for it is never comparable to the true tough thread of such plants as have had better advantages of growth.

This strongly confirms the rule we first laid down, that flax never should be sown but upon firm soils, which approach to the nature of clay. In these the root is defended from the sun, and supplied with moisture as long as is required for the service of the stalk, and consequently the reducing the quantity of juice sent up, and the drying of the fibres, which happens naturally from this cause, come on gradually: whereas, in the field of flax on a dry light soil the sun has free admission to the roots, and the supply of moisture ceases: the drying of the fibres is performed too suddenly; and they are scorched up instead of gradually hardening. Hence the term used by the farmers of *firing*, is not so improper as it might sound at first, and the pulling it immediately becomes unavoidable.

The seed of this flax not having attained maturity when this happens, can never be perfect, and therefore the plants raised from it must be poor.

These are reasons which abundantly shew that flax will never



never be raised to advantage in England, unless it be a first rule not to venture it on any occasion upon loose and dry soils.

No ground should be thought of for raising of flax which has not a due quantity of clay in its composition. The soil in which flax is cultivated in Courland, Livonia and Muscovy, is said, by travellers, to be sandy, but it is in reality a very rich loam. The husbandry of that country is not equal to ours. The sand appears upon the surface after rains which have washed down the heavier part of the earthy matter, and carried off too much of the lighter particles. In this condition it appears sandy, and is therefore called by that name; but though sand is seen on the surface, there is a firm mould at the bottom; and it is in this the flax roots; and to this it owes the nourishment which perfects the stalk and ripens the seed.

The effect of the loose surface of the earth in those lands is, however, disadvantageous. It makes the stalk dry too hastily when that operation is once begun; and consequently the flax of that part of the world is usually pulled somewhat earlier than any would wish. They have the art of managing it while it lies upon the ground better than all other people, and by that means they get the better of a great part of the natural disadvantages; but the seed, though very fine, would be more perfect, if the plants had stood longer upon the ground: and indeed there is a great deal of difference in the several quantities of flax seed we receive from thence: some being full, plump and perfectly fine, and some on the other hand poor and thin. This is the difference between the seed of one crop of flax and another, though they have grown upon the same kind of soil: the season will make them so far exceed or fall short of one another; and in general there is this difference: but the fruit of all the seed from that part of the world is such as has had the deepest and toughest of their soils; when the plants have come to their maturity in that gradual manner which is so essential to the perfection of the stalk as well as the seed.

#### CHAP. XLIX.

##### *Of the draining of marsh land.*

THE quantities of land in this kingdom, which are subject to the overflowings of salt water, from their lying either near the sea, or in the reach of the high water of large rivers, are very great; and the advantage of securing them from this accident is obvious. Great tracts of ground might be raised to a higher value, which at present are more useless than if they were sunk at the bottom of the sea; for the vapour that rises from the wet mud left upon them, infects the air, and destroys the inhabitants. The civilising of nations by degrees removes these natural annoyances; or in the best state of the account, turns them into benefits. We boast of having all its effects here; but this is an instance that we are too vain of our improvements. Many of those marsh lands which are destructive to all who breathe the air of them, unless they have been born in it, may be rendered healthful and pleasant, by proper draining and securing of them against inundations; and the very cause of the mischief would then become the means of their fertility.

The mud and weeds, with the refuse of animal bodies, and other substances of the like kind, which the water brings upon these lands in overflowing them, is the cause of that stench, and the offensive vapours which rise from them, and this is a most excellent manure.

Egypt, at this time the most fertile country in that part of the world; and for ages past, the granary of all the neighbouring nations, is naturally a sandy territory, waste and barren: the source of all its fertility is the mud and refuse of floods left upon it, by the regular overflowings of the Nile. We may by art turn to the same account the overflowings of our own sea coast, and the like lands. The advantage possessed by Egypt is, that the flood comes at a certain time, and they are secure from inundation the rest of the year. The rich mud therefore which the river left when it retired to its channel, may lie to dry at leisure, and afterwards is to be cultivated without danger of a second flood, while the crop is upon the ground.

This is all the difference in the present respect, between Egypt and the overflowed lands of other countries. It is a happiness that nature provides them a security against a second inundation, while the crop is growing; but what nature does for the Egyptians, we may procure for ourselves. We may receive those floods upon the land which come rich and full of this nourishing matter, and we may secure the ground against being overflowed afterwards; thus the refuse of the flood will be left in all its strength

upon the ground, and may be used in the same manner as the mud of the Nile in its proper country. The land being kept dry, will no longer yield that offensive and unwholesome stench, and the crops will thrive abundantly; for this matter, thus left by the water, is at once soil and manure.

These are the advantages, and no pains should be spared to obtain them. The expence is often considerable, but it is a benefit that lasts; and the owner of such land should never compute it, without laying down, at the same time, the additional value of the spot. In general, it is recovered from a state wherein it is worth nothing, and the undertaking should be considered as a kind of purchase.

A sloping bank will be at all times a security; and the materials being on the spot, the whole expence is labour. If the bank were raised perpendicular against the sea, it would be soon washed to pieces; but the strongest power of the waves is lost, when they are received upon a slope and easy ascent.

According to the height to which tides rise, the bank must be carried up higher, or less high. In general, about seven foot above the level of the land is sufficient; and this will require a bank of twelve foot diameter at the bottom, which may slope off to about a yard thickness at top.

If the ground be covered with a turf, let that be saved for facing the bank to the sea; and if otherwise, as soon as it is made, let it be sown thick with grass seed, that there may be a natural covering of the same kind. The grass seed for this purpose should be that of a salt marsh, not of common meadow hay, for there are peculiar grasses which thrive where the sea comes; and these only are fit for the facing the absolute bank of the water.

Open a trench of the same breadth, which will be necessary for the foundation of the bank, and begin the work at three or four foot from the edge of the trench. This trench, which is to supply the materials for the bank, will, in common cases, require to be about four foot deep; and the stuff is all to be worked up into the bank as it is dug. For the intent is, that it shall bind firmly; and all earths will work closer, and hold better together if wrought up just when they are taken out of the ground, than after they have been at any time exposed to the air.

The bank should go off in such a gradual slope to the sea, that from the top to the bottom should be eighteen or twenty foot in such a bank as we have named; but to the land, it need not have more than two thirds of that slope. If the sea is subject to be very rough, and to beat violently upon the shore in this place, the turf, be they ever so good, should be employed only to face that side of the bank which faces the land; for if they be used on the sea side, the tides will wash them off before they can mat themselves together by their fresh roots; and they will only fill up the bottom with refuse. The sowing of grass seed is the only method to this purpose: the slope of the bank must be raked fine and smooth, and the seed sown very thick upon it in the evening of a mild day, and raked and trodden in. A few days will bring it up; and as soon as the new grass is five inches high, it must be mowed, that it may not run up to stalk. This will give strength to the roots, and they will in a little time spread and entangle themselves in such a manner, that the face of the bank will be secure against all damage, covered by a kind of tough carpeting of mats; and so level in its ascending surface, that the waves, though ever so furious, can only run gently up; doing no damage, because nothing opposes them.

The trenches, if properly managed, will serve as drains for the land; and there may be an aperture from them, with a flap door which opens outwards, as we have directed for the draining of marsh land in our former volumes; which will let out the land water, without any possibility of letting in the sea.

Whoever sets about this work, must begin with a resolution not to trifle; and the quicker it is done, the better. As many hands should be employed upon it as can work upon the ground without standing in one another's way: the price is the same in the end, whether a smaller number of labourers do the work in a longer, or a great many in a shorter time. and the advantage of employing numbers, is, that the whole is done together without those interruptions, which occasion cracks and inequalities in the work: and the earth binds the closer, for being wrought as soon as it is taken up. High tides and storms are often very troublesome interruptions in this kind of business; but these also are less to be feared, when the work goes on briskly.

If at any time while the bank is fresh made, the water breaks in upon a part of it in a storm and begins to wash away the mould, the utmost care must be taken to prevent the spreading of the mischief; for when one piece of the



substance is torn away, more will quickly follow. The first security is to stretch a piece of sail cloth over the part that is broke in upon, and fasten it carefully down. The waves will rise over the smooth surface of the cloth, as they do in other places up the surface of the bank, and this will secure the broken place for the present. Then as soon as the tide is down, or the storm is over, many labourers must be set to work at once, and the breach in the surface perfectly repaired. The slope of the bank must be again laid entirely smooth and even; and pressed and wrought firmer than in other parts.

When there is an opening from the sea, which at once lets in the water from thence at high tides, and lets out the freshest from the neighbouring lands into the sea at low water, we have given the common method of lodging a trunk in the bank, with a door that opens outwards; but in cases where a sluice may be necessary, there requires this farther direction, that it be made very strong, because of the weight of water it is to resist and support: and that it be built while the whole gap which lets in the sea is open. The broader the passage, the less is the violence of the force in any particular part. It will require to be all banked up afterwards; but the work of the sluice will be much better conducted, while the whole is open, for in reducing the gap to a smaller compass, new force is given to the water. Therefore let the foundation of the sluice be laid in the lowest part of the channel, and let it be made strong and sound. When this is finished, let the bank be made each way from it to the high ground: and in this, as in all other such works; let hands enough be employed; for nothing is so useful in these undertakings as expedition.

#### CHAP. I.

##### *Of the securing of land, liable to be overflowed by rivers.*

**T**O the general rules we have before laid down on this head, it may be proper to add here certain cautions, which have arisen from later experience, for the facilitating that work, and securing its success. The security must be given by banks, and these will require to be of the same form with those made to keep out the sea; only that they need not be so strong, as the force cannot be nearly so great.

The sea often beats full upon the bank, which is made to keep it off the land; but the river runs lengthway of it. Its course takes off a part of the dead weight, and the common motion forward prevents the lateral pressure: this makes a great deal of difference in the necessary strength of the bank for one occasion and the other; and there is also a vast disproportion in the absolute weight of water to be resisted.

This may shew the husbandman, that the banks which keep out a river, have no need to be nearly such as those which keep off the sea. But let him not carry this account so strictly, as to reduce the bank, which is the sole defence, to too small a compass.

The height must give the general rule for the thickness; and this must be proportioned to the rise of the water, which is to be feared. The computation in this instance is more difficult, than in the other; for the rise of tides is pretty exactly known. And these occasion the floodings of land from the sea; but the rise of rivers is from rains, and these are less certain.

Always guard against the highest that can be expected. It is very seldom these are known to rise more than three foot perpendicular above the level of the land, that is to be secured from them; and taking this as a middle computation, we may give the height of the bank, and its other dimensions, these naturally rising from that.

The first rule is, that the bank be a foot higher than the highest expected rise of the water; therefore we will establish the present at four foot; and for the construction of a four foot bank, the breadth at the base should be six foot, and the longest slope, that is, the side to the water should be ten foot. Then a slope of six inward or toward the trench, will be sufficient. The trench itself will require to be five foot deep, and the base of the bank should be on that side, at the distance of eighteen inches from the trench. The work is to be regularly carried up as we directed in the other case, and the top of the bank to be a foot and half broad.

This will be measure sufficient for strength and soundness, and the whole will be finished at a very moderate expence, considering the advantage.

The great care to be taken is to know the utmost height to which the river is to be expected to rise, and the bank must be carried up so much higher than that, as to leave no fear of over-running.

The distance from the river is a very material article al-

so: for the rapidity with which water pours down from the high grounds, after violent and continued rains, is such, that it sometimes will over-run all banks, unless there be left a sufficient compass. In the fen countries they make banks of eight or ten foot high, and they raise them at such distance from the river as in particular, in some parts, that they allow a quarter of a mile or more for the reception of the water, which yet will sometimes rise over those high banks at that distance, and overflow many thousand acres of the flat land.

This example may shew the necessity of taking scope, and raising the banks high enough in the banking of rivers. Nothing can lay down rules for this height and distance in particular instances but experience, and this is to be sought from the testimony of the severest and most intelligent persons, where there is not ocular proof.

The great security of banks is the free course of the water between them, and the ground is not lost which is between the bank and the river. The time of floods is the only part of the year when it is overflowed, and these leave their manure behind them; for there always is a settlement of fine and rich mud. The ground being enriched by this, will produce a great quantity of grass. These lands answer very well for grazing, as the Lincolnshire farmers find; and as ditches serve to separate them from one another, instead of hedges, these being always wet, the water-trees may be planted to advantage upon their banks; osiers, willows, poplars, and the like, thrive there perfectly well; and though these are of much less value than the generality of trees, yet they answer in places where they grow without care, or trouble: for a branch of any of these struck into the ground, with the top cut off, becomes a tree.

The expence of banking is less than those could conceive, who are not accustomed to it: for though it is all done by labour of the hand, which is usually chargeable, the soil cuts as easy as garden mould, and the riddance that is made would surprise any that are not accustomed to such undertakings.

In taking the account of the highest rise of floods, whether it be from observation, or the accounts of other persons, the farmer should always suppose them something higher than the mark; for the making a bank somewhat higher than it need be, is no inconvenience, beside the small additional expence; but the erring of the other side is giving up all the expected advantage.

The undertaker is not to suppose that he can add to the height of the bank afterwards, if it be found needful, by carrying the top higher. All the parts of a bank must be proportioned; and the height considered in the base; or it will be of no value: the weight of water which will bear against the banks at the time of flood is so great, that they will be destroyed by any irregularity in their form. There is nothing can secure them against this, but the gradual slope of their sides; and this slope will be lost, when any height is to be added after the work is finished. The breadth we have allowed for the top of the banks, in the proportions we have named, is absolutely necessary; and if the undertaker should think he could add height, when he afterwards found it wanting, by raising these up to a ridge, he would deceive himself entirely; there would be no security in a part, whose sharp edge would be always wearing away; and on the other hand, if he attempted to carry it up straight, the alteration of the shape, in that part, would give the water power, when it rose so high, and the new work would be presently washed away. Therefore there is no method of heightening a bank, when it is once made. If it should be attempted, by giving it a new coat all over, that would not be secure, for it would never mix with the rest, and the waters would wash it off. The first design gives the whole hope of security; and that must always be proportioned to the occasion; upon such principles as those we have laid down, the measures are easily varied, and banks of any height, or for any purpose, may be erected on the like plan.

The season most proper for banking is the latter part of spring, and the beginning of summer. This is a time when labourers are easily spared from other employments; and when there is no danger of floods in the prosecution of the work. The hay seed sown upon the slopes readily strikes root at this time of the year; and the earth which is to be wrought digs freely, and binds well together, because of the remainder of the winter's moisture that is yet in it.

If the ground be very tough and strong, the bank may be begun nearer to the edge of the trench than we have named: for the reason of allowing a foot and half distance, is, that the edge of the trench may not break in by the weight of the bank; and the stronger the ground, the less danger



danger there is of this. On the other hand, when the soil is very moist and crumbly, it is best to allow a larger space, for the same reason: because if the weight of the bank breaks in the edge of the trench, there is danger of the bank itself giving way, or at least of a weakness in the adjoining part, which the next storm will burst, or the next flood will bear against that part, and probably break it in. The depth of the slope is a security in some degree against this danger; for the more perpendicular the edge of the bank stood, the greater would be the pressure; and on the contrary, the more gradual the slope, the less the force: and added to this the distance of the very bottom of the slope from the verge of the trench, compleats its security.

The undertaker understanding thus the nature of the work, and the purpose of this distance, will know how to lessen or increase it, according to the nature of the ground: and tho' the first care must be to keep it secure, yet when that is regulated, the nearer the bank rises to the edge of the trench, the cheaper is the work; for at the best there will be a considerable distance from thence, to the farther part of the base, and this will give so much the more trouble in working it up. These are the considerations which direct the banker in this article; and every little point ought to be observed in large works, because it becomes of importance from the quantity.

#### CHAP. LI.

##### *Of preventing the water on high grounds, from overflowing these below.*

WHEN the same person is owner of the high as well as low grounds, this is easy: and the damage, when it is omitted, is so great, that none should neglect it even on the least occasions. There are grounds so situated, that the sudden fall of rains upon the higher lands behind them, have as absolute an effect in overflowing of them, as the sea or rivers have on others: the method is to give the water a free and fair course, without allowing it any place of irruption into these grounds. The cutting a few drains in a proper direction, will answer this purpose, and their own earth banks them. When they are by these and the preceeding directions secured from all fall of water from other parts upon them, the next care must be to prevent their becoming too moist, from the rains which fall on their own surface.

There are low grounds of so loose and spongy a soil, that the very water which comes upon them in rains, without any drain from elsewhere, will swell the surface, and keep the land in a condition approaching to the nature of a bog. The grass will be poor and sour; and the feet of cattle will break through the turf. This is generally occasioned by a firm bottom, which detains the water, and by some natural head in the lower ground: in this case drains must be cut, if the piece lie naturally secure from inundations; but if it be banked out from the river, there must be a sluice in the bank for the discharge of the wet. A very small one will answer this purpose; and the land will be kept just in what condition the owner pleases.

There is no situation in which the farmer has the advantage of flooding his lands at pleasure, like that of banking. In this case, as it is his bank alone that keeps out the floods, he can, by making an opening, let in the water; and if he watch the proper time for this, and conduct it properly, nothing is so great an advantage. He manures the land without expence, and that in a better and more equal manner than could be done any way else.

He must observe to let in the flood at a proper time, and when the water is in a right condition: and he must suffer it to remain on no longer, than while it is able to do service. For long lying upon the place, will soak the earth too much, and make the grass sour.

The time for letting in the water is the beginning of winter. And it should be done at the first of the flood, that is, as soon as the water is well impregnated with the rich particles of the lands from which it has run.

In the beginning of floods the water is thick, and full of the light and rich mould of these upper grounds, and of the best parts of their manure. But this, if not let in upon the grounds, runs off to the sea; and is lost, and the remaining water of the flood is poor in comparison: it comes thick indeed, but it is often yellow with clay, or the other foul bottom of the ground.

Therefore at the first of the flood, let the farmer open it a passage upon his low grounds; and when he has got enough of it to cover the lands, let him close it in. He must let in no more, for that would keep the whole in a continual disturbance; and his business is to let it absolutely rest. In this case a settlement soon falls from it; and as

soon as that is done, the water is to be let off again by opening the sluice, or by drains. Thus it will only have lain long enough to moisten and mellow the ground, and will have taken some of the finest part of the mud in with it. The rest will lie like the mud of the Nile, in a thin even coat upon the ground, and the next rains will wash it in thoroughly. Thus that which in a state of nature would have rendered the ground useless, becomes, under the management of art, a source of fertility. If once flooding does not answer the farmer's purpose, it is easy to repeat it, and the doing this at several times, is better perhaps than covering the surface too deep at once.

By this method of banking out the waters, and letting them in again at the pleasure of the farmer, the grounds which before were useless, become excellent pasturage and hay lands; and a few years of the produce, pays the whole expence. The ground thus recovered, may be planted in proper places with trees; and thus every advantage obtained from it, that can be expected from such land as nature has placed in the best condition.

#### CHAP. LII.

##### *Of roads.*

NEXT to the raising the farmers crops, the most essential consideration is that of his carrying them to market, and this brings into our view the roads by which they are to be conveyed. There is scarce any thing more neglected in England, than the care of those roads which are not under the publick inspection and control. Turnpikes have made the great roads excellent, but in bye ways, where only farmers, or few others come, the lanes are usually torn to pieces, and gullied in holes in such manner, that it is scarce possible to pass them. In clays the wheels generally rise at one foot and cut deep into a hole in another, and the very mending of them, where it is attempted, is so little underslood, that the remedy is often worse than the disease.

The proper work is easy, and if it be a little more expensive at first, it pays many times over by the continuance.

Of all ingredients for roads large gravel is the best; and this is plentiful enough in England. It may in many cases be dug upon the spot; in most, very near; and it should be laid on immediately from the pit, because then it binds much faster than it will afterwards. The clay and loam which are among gravel, are tough and clammy while the gravel is fresh, but when it has been thrown up at the side of the pit, the sun and air calcine these earthy ingredients, and they become crumbly: and in this case the wet washes them soon away; and leaves only the pebbles, which wanting their natural cement, will be a long time before they are brought into a condition of service.

The best gravel for roads is that which has a great quantity of flints, and a moderate portion of this clay or loam in it: for such alone will bind firm. Pebbles are rounded, and there will require a great deal of a tough matter to bring them into a compact mass; but the flints are irregular in shape, and they lie agreeably enough among the pebbles, so that less of the earthy matter binds them: and when such a gravel is well laid, and broad wheels are first brought over it to bring it into form, it will in a little time cement into a body like rock.

When such a gravel is chosen, the making the bed of the road is the next consideration. This is always to be done with the matter that is upon the spot, unless there be deep holes or other great inequalities to be made up.

The bed of a road should never be flat, for the covering must be of the same form with the bed; and if the road be flat when it is finished, the water will lodge upon it, and every hollow made by the carriages will be soon sunk into an absolute hole.

On the other hand, the raising a road too high is no less a fault; this endangers the turning over of carriages and many accidents; and it answers no good purpose which a very small rounding would not serve as well. If there be height enough in the middle to throw off the water, and the sides be so rounded away that none can lodge there, it is all that can be required. A natural hard bottom rounded well off, and covered with such a gravel as is here directed, will make a road that will be always secure, good, and lasting.

In making a road in this manner, the first care must be to examine the natural bottom: if that be clay, though in itself it make a very bad road, yet being covered, it will be a very fine one. In this case no more is required than to clear off the dirt from the surface; and then when the pure clay is seen, the holes must be filled up with some of it, and the surface of the whole intended road laid



in a regular rounded form. This should be raked over, and upon this should be laid the gravel. It must be spread every where to an equal thickness, and then the first carriages which are brought on must be broad wheel'd. These must be drawn in different tracts till the road is as it were rolled by them, and thus in a little time the whole will be wrought and fixed, and will unite into one body like the walk of a garden. When it is once arrived at that state, no water will lodge upon it, nor any carriage hurt it.

This is an effectual and excellent method of mending bad roads for the service of the farmer, or rather for making good roads in the place of bad ones. For this is absolute new work though the expence be small. But this advantage is only to be obtained where the bottom is good; as where the soil is clay, or something sound and hard, of the same nature. In other cases there will be a necessity of making an artificial bed for the gravel; and this must be done by means of some other ingredients.

When the natural bottom is tender, stones should be thrown on, if it be in a country in which they lie near the surface; and if otherwise, brickbats and the rubbish of old buildings will answer the purpose. These will form a loose bed, and will perfectly well receive the gravel. It will fall into the holes between them, and make up with them one very good and firm body.

Where the case is still worse, and the ground is rotten with great hollows, these should be filled up with faggots: and none answer so well as blackthorn, or a mixture of that and alder. The more wet there is, the larger quantity of alder should be admitted, for where this wood lies always wet, it lasts a vast while. In either of these cases the faggots are to be considered as a kind of understructure; like the piling of buildings. and a bed of clay or other tough earth should be laid upon them in the proper form; then some stones or brickbats, and upon these the gravel. In this manner the road will last a great while, and there is no expence the farmer need so little grudge. The dirt that he takes off from the surface in any of these cases, will serve as manure for one part or other of his land; and the rest of the work will give him so much comfort in the conducting the rest of his affairs, that it is the best money he can bestow, after the immediate care of his land.

As the farmer will naturally dig the gravel for this occasion on his own ground, and as near as he can, let him observe the quality of it. In the bed very often there is a foul and coarse kind in one part of the stratum, and a pure and fine one in another. In this case let him keep them separate, and lay on the foul coarse kind first, reserving the other to make a coat or crust for it.

The gravel should be raked as it is laid on, and the hardest part, that is, the largest stones drawn up toward the middle. If any hollows appear after the first quantity is laid on, let these be very carefully filled up before the second quantity is drawn over; and the whole being finished as expeditiously as the nature of the work will allow, for the quicker it is done the better it will bind together. As to the height of raising the middle, about seven inches is the best rise in a road of twelve foot over, and in the same proportion it may be made to answer any breadth.

The quantity of gravel necessary upon these roads is not like that on the great high roads repaired by turnpikes: the continual heavy carriages on those make a great depth necessary; but in these farmers roads upon a very good bottom, seven inches depth of gravel will be sufficient; and in the worst, from ten to twelve will be the most that need be used.

The breadth of one of these roads should never be less than eighteen feet; and always the broader the better. This small compass here mentioned is only to save expence, and is the least that can, with any convenience, answer the purpose.

It is common to plant trees along the sides of roads, but the farmer should have some advice on that head. The advantage of timber is very well known, but things may be rendered detrimental by their consequence that are ever so good in themselves. The great article in keeping a road good is the preserving it dry. Care is taken of this in the raising it in the middle for carrying off water; and every other caution should be used on the same occasion; a road that is wet can never be firm, and one that is shaded by trees will very seldom be thoroughly dry.

When roads are very broad, plantations of trees succeed extremely well at their sides, because there is space between, and a free course for the sun and air: but it is not so in narrow roads; these will be over-shaded by their heads and branches, and consequently the ground will never be hard. In large roads the plantations of trees are as

so many avenues, beautiful as well as useful; and they thrive because their roots run under the surface of the road, which is a great space that no growth exhausts. On the other hand, the rows of trees in a narrow road, form a kind of long arbour or shady walk, where the ground is rotted by the continual damp; and the next grounds are the more exhausted by their roots as the space of the road is narrower, and affords them less nourishment.

Therefore, if the farmer chuses to plant trees by these roads, let them be pollards for shrowding, not upright ones for timber. And let him take care the shrowds of these do not spread too far; and cut them rather oftener than he would in any other place. By these means the ground will be kept dry, and yet there will be some advantage of a plantation. Pollard trees do not answer in any proportion to those which grow for timber; but there is a convenience in the quick growth and frequent cutting: and it is a sort of wood the farmer always wants. In the planting the sides of these roads, let him observe the soil, and suit the trees to it, according to the kinds directed for the several soils in our preceding volumes. These little considerations have great advantages; but they are too much neglected. He who in every article of his profession takes in a view of the whole, will be most likely to succeed to the full extent of his purposes.

In many cases it may be in the power of the husbandman to make a new road in other ground, instead of mending, or as we propose new making the old; and in that case he should consider which will be most worth his while. No certain rule can be laid down for this; but according to the circumstances, he will find most advantage in one or the other.

The first consideration is, whether he wants the dirt of the old road any where near the place for manure: for this dirt must be all taken off, whether he has any use for it or not; and consequently, the expence is considerable, if it be not wanted within some moderate distance.

That the dirt of such a road will be a valuable manure, is very plain from its own nature, and from what we have said in explaining the kinds of manures. This dirt is the mould of the surface ground to pieces, with the dung and urine of cattle mixed among it, and the rotted parts of the leaves, and boughs of the trees. Add to this, that it has lain a great while unexhausted by any growth, and the whole consideration is greatly in its favour as a manure. If the trees have shaded it, it is so much the better; for the farmer very well knows, that ground which is shaded always grows mellow. His crops of pulse improve the land principally by that means; and it is a certainty that shaded ground, though it does not bear any thing while it is shaded, becomes very rich by that means, and is ready for producing crops as soon as properly exposed.

From all these considerations, the husbandman may be assured, that the dirt of one of these roads, which must be cleared away in order to the mending them, will be an excellent manure: but its value is of no consideration if he does not want it, nor have convenience of selling or using it: in this case it will be cheaper, if the other circumstances are in his power, to make a road in new ground, than to repair in the manner we have mentioned this other.

In the repairing the old, beside clearing away the dirt, there must be some expence in filling up of holes; and as the whole surface of the bed of the road must be laid regularly, there will be much more labour in bringing this old worn and rough piece to that true shape, than in clearing off a new spot of ground.

In new ground, if the under bed of the soil be of a right kind, the road may be wrought with very little expence or trouble. The regular method of doing it is this: if the upper coat of the ground be absolutely firm loam, mark out the breadth of the road, and at each edge of this space open a ditch, leave the surface of the ground between in its natural state, and raise it to form with what is dug out of the ditches.

The upper coat which comes up the first spades depth, must be kept for other uses. If it be piled up in a large heap, the turff will rot, and it will be a good manure; and will be worth carriage to many parts of the land that want refreshment. The next bed of earth is to be used for the road; and so on, to as much depth as is necessary for the raising the middle of the road to a due height. When the ground is marked out, and the upper spade's depth of soil is taken out of the trenches, let the whole be looked over, to see if there be holes in any part. In that case they must be filled up with stones, brickbats, or other hard ingredients, so that the whole surface of the ground between the trenches be made level, before any thing is laid on.



If this be omitted, the hollows in the ground will be so many holes in the road, in spite of all care or prevention.

When this is done, let the earth from the two trenches be thrown to the middle of the ground, intended for the road; and let it be spread and raked off to the edges: till by this means a bed is prepared, such as we have directed in the other case, to be made out of the natural surface. This should be sufficient to give the whole that degree of roundness which is needful for throwing off water; and when it is thus prepared, let the whole lie five or six weeks to dry and harden.

At the end of this time, let the gravel be brought on, and laid in an even covering from the centre down each side. Then let broad-wheeled carriages, and no others, come on to press it; and let them be drawn along every part, that the whole may be pressed equally. It will thus make a firm, sound, and lasting road.

This is a very good method, where there is this middling kind of ground, hard enough to support the gravel; but not sufficient to stand the pressure of carriages alone.

Where the under stratum is gravel, the work is much easier; and no roads whatsoever are so good, as may be made in this cheap manner. Mark out the form of the road by a gardener's line and stakes, and then dig away the upper soil one spade deep; or if it be requisite, a little more. It seldom lies much deeper than this over gravel.

When this is cleared off, and laid in heaps to rot for manure, level the bottom, and thus make an even coat of gravel. Bring in more gravel to fill up the place of that which was dug out, and to raise the ground a little higher in the middle, to throw off wet. This is less needful in these than in any other roads; and may be omitted; but it is always best to do it: a very little more gravel answers the purpose: for it is in all soils a good rule to throw off the wet, though gravel receive less damage from it than others. In this case, the road is in a manner made upon the solid foundation of the natural ground; and the earth at the two sides forming a steep bank to the new quantity, serves as an abutment on each side, against which all the pressure of carriages can have no force; and consequently the road it supports, must continue strong and good.

As soon as these roads are passable for carriages, the surface must be marked with a careful eye, to see whether it sinks in any place. Wherever this happens, the hollow must be filled up with large hard gravel at once, and the surface levelled with the rest; for it is easier to remedy these faults when they are new, than when the weight of carriages sinking hard into them, has not only made the hole itself deeper, but disturbed the neighbouring part of the bed; which is always the case, when holes are left to bulge.

Any rising of the ground is also to be observed, while the road is new, and should be levelled; for the consequence of letting it remain so, will be certainly an hole just beyond it. The wheels are raised up by this swelling, and they run off from it: they either break the level just beyond the rising, or at a small distance forward, where they meet a stop.

As water lodging upon a road always damages it, there should never be any one made without a ditch on each side of it to receive the water, which, in our way of constructing it, will run off its sides: and care must be taken for a free passage for this water, at least when it rises beyond a certain level; for if it be permitted to soak the ground under the bed of the road, the whole work will soon come to decay. The great care is to keep all dry above and below, for wherever the earth is wet it is soft; and wherever there is a soft part in a road, the weight of carriages will find it, and it will presently be pressed into a hole, which, as the cause lies below, it will be impossible to cure by any addition above: and if it be unseen, disregarded, or misunderstood, it will spread till the whole work will be in a manner spoiled.

We have seen that to preserve a road good, it must be kept dry; and one essential quality is, that the bottom should be hard: but by a neglect in this matter, of letting the water out of the ditches, both these good purposes are destroyed. The ground above can never be dry, because the bottom is wet; and that which is wet, cannot be hard. One would think propositions so self-evident as these, must occur to every body, and could admit no oversight; but the husbandman is accustomed to do his business in a certain road, and out of that he is at a loss for any thing.

Very few years since I saw two instances of this damage in Northamptonshire, of very different kinds, but plainly tending to the same end, the destruction of the road; and from the same cause, the soaking of the under part with water. The one was in a farmer's road made in a turfy

soil, by cutting two trenches, and piling up the earth between them. These trenches were twelve foot distant, and the road of that breadth. It had succeeded very well for some years; for though the trotting of a horse would shake it for a vast way, yet the wheels of carriages were very well supported on it. But after this time, the ditches filled up at the ends, and the water soaked the bank or road. The consequence was, that it became impassable; for the wheels cut in, and made holes that could not be mended, and even the horses fell in often up to the belly. This was removed by clearing the mouths of the ditches, and repairing the holes with thorn faggots, and tough earth over them; and the road became, and now continues as good as it was at first.

The other instance was in a road made also with two trenches, and covered with a rough irregular stone, which is common near the surface in that county. It succeeded as well as the other till the ditches kept full of water; and then the stones, which had before lain upon the bed of the road sunk: this while it continued dry, was a sound and good earth; but being now soaked with the water, it soon grew rotten, and the stones, which had at first lain flat or nearly so, sunk in at their ends and stood edgewise; and soon after the heaviest of them went through; the whole, instead of a firm hard road covered with stone, became a parcel of absolute mud full of stones lying in it in all irregular directions, and the place was altogether unpassable. This was its condition till the cause was seen, and the water let out; but even then it was necessary to take up the whole road, and lay the stones even, before any thing farther could be done. The expence was very near as much as that of the first making the road; and it might all have been prevented by keeping the passage of the water clear to a certain level.

These trenches or ditches at the sides of roads, beside the constant care of keeping the course of the water out of them clear, will require sometimes to be cleaned of the mud at their bottoms throughout; and this may be done without any real expence, the mud serving according to its kind as manure for some of the lands; and very well paying the expence of taking out and carriage.

We say according to its kind, for it will partake of the nature of those ingredients of which the road is made, and according as that is gravel, stone, or other substances, this mud will be suited to various kinds of lands: this we have explained at large under the article manures.

Summer is the only season for making of roads, and the earlier in that time this work is begun the better it will succeed. We know the effect of frosts is to moulder and break the toughness of earth, and this in roads we want to preserve: therefore the summer is the only time. Wet is the great enemy of new roads, for the first article we want is their drying and hardening. This also throws us upon the first months of summer, because there may be reasonably expected a great deal of the proper weather to follow. It is also a season, as we have observed before, when hands may be very conveniently spared for the business. Roads which are naturally good are easily preserved in that condition, by only filling up the holes at times as they are made, and rounding off the sides so as not to let water lodge. This is very easy when an eye is kept upon them from time to time, but there is nothing that gets so much mischief by neglect as a road; and there are very few things wherein that mischief is not more easily repaired.

Roads are naturally worst in the wettest countries, and therefore it is there the greatest care must be taken of them. The same principle holds good which we have established for draining of lands, and the work is the easier as absolute dryness in the ditches is not required.

It is very particular what the author of the scheme of raising hops in bogs advances in relation to the height at which water may stand without damaging the ground; and this is in some degree verified by what we have observed of roads. The water in the trenches will not soak the ground though it rise to a considerable height, so it have at that height a free passage.

#### C H A P. LIII.

*Of the mud of the mouths of great rivers considered as a manure.*

A Farmer in Sussex was observed to succeed better in his crops than his neighbours, and after many years wonder they began to enquire into the cause. He had never made any secret of it, and the neighbourhood now enjoy the advantage in common. The whole sea coast of the kingdom, near the mouths of great rivers, may afford us a manure: the mud and settlement of these waters after floods;



floods: and the thought was so natural and so correspondent to what we know of the effects of things in farming in general, that it is wonderful any who had the opportunity neglected it. The farmer knows that the common mud of rivers is, on many occasions, an excellent manure. He knows also that in floods it is much richer, because the rains have washed into it the finest mould, and part of the manure from those cultivated grounds upon which they have fallen, and over which they have run. He lets these waters in upon his pasture land where he can, while they are yet thick with the mud, that the rich manure may settle from them and fertilize his land; whether or not they are thus used the mud will settle, and wherever it does so, there is this rich manure; and it is well worth the taking up.

Often there are irregular openings into the land near the mouths of great rivers, into which, when the water is received, it has time to settle, and the mud is separated from it, and is in the same state with that which is left upon a piece of ground, where the water of such a flood has been purposely let in, and has stood to subside. There are also banks about the edges of rivers in many places, which in the same manner detain the water and receive the mud; and even upon the coast of the sea itself, there are often shallows among rocks or behind points of land which receive the water as it has run out from the mouth of the river, and give it time to settle. From any of these the mud may be taken with great ease, in the same manner as it is dragged from the bottoms of shallow rivers, with an instrument made hollow for that purpose, and fixed to a long pole.

The expence is little, and the benefit is surprising. The mud thus collected has many times the virtue of that from the bottoms of rivers or ponds: for it has the advantage of all that fine and rich mould which the flood washes from the high grounds; and with this of the salt of the sea. Few know how great and excellent a manure this is: we see the addition of a little sea salt is an excellent improvement in manures; and the benefit of steeping seeds in brine is known to every farmer. But sea salt in the one case, and brine in the other, though they approach to the nature of sea water, fall very far short of its virtues. They are made from salt, one ingredient of the sea water only; and there are many.

In the present case the farmer has the advantage of them all, he has a rich mud mixed with a small quantity of sea sand, and impregnated with all the other virtues of sea water, as also full of the parts of sea plants and sea animals, all excellent in manures. Experience shews, that one load of this is equal in effect to three of river mud; and reason easily explains why it is so. There are the advantages of many manures in one, and they are such as unite happily, and join their influence agreeably in promoting the effect of each other.

It is only in places situated conveniently for this particular manure that it can be had, and it would be vain and idle to attempt the mixture elsewhere; for salt will neither in this, nor any other instance, really answer the purpose of sea water. Where it is any where near, it is worth while to get it, for it is one of those manures that will very well pay the price of carriage.

Nothing equals it for those grass grounds which lie high and bear a sweet grass, but not thick; for it encreases the quantity without hurting the delicacy of the growth.

For this purpose it should be laid wet upon the ground, and spread after it has lain long enough to crumble and obey the hand of the workman: then if it be rolled over, the rains which follow, wash it entire into the ground, and in three weeks there shall not be the least appearance that any thing has been laid upon the surface; but the spring shoot will soon after shew it. The effect upon grass grounds will very well last three years.

It is of equal use on land that is in tillage, but experience shews that in this it is not so lasting. A quantity of this spread upon a poor hungry piece of corn land gives it, for the time, all the qualities and properties of the most rich soil; but the benefit is, in a great measure, confined to the present crop, for the rains wash away the salts, and the sun exhales the animal part in a very little time, where the soil is thus open and the surface exposed: but the covering of the turf preserves the particles of the manure longer in the soil, and the roots of the grass being perennial, the strength and vigour they receive from this dressing, continue with them to the succeeding years.

In a saintfoine ground which has stood a long time, and is grown weak, this is also an excellent refreshment. If the crop have been planted by the drill for horsehoeing, let a quantity of this manure be spread over the intervals and plowed in: if the plants rise promiscuous from the common

method of sowing, the best opportunity is, when they are eaten close, to spread a quantity of it after it has lain to dry a little, and can be conveniently distributed equally over the land. This is not equal in effect to the other use of it, because with the richness of the addition, there is in that case also the benefit of a plowing between; but in either case is excellent, and it does for each crop as much as it is possible for a manure to do.

These are the best methods of using the sea mud alone, but when the farmer has not immediate occasion for it for these purposes, he will find it very well worth his while to collect it in what quantity he can, and mix it in among his dunghills. It will thus rot and blend with the rest, and will give a very great additional richness to the whole. In the use of it on corn lands we have been obliged to acknowledge that its virtue is not lasting; but this method of mixing it with the dunghills and making it rot and mellow with the rest of the matter which composes them, gives it the same faculty of lasting in the ground that they have, and the whole dunghills are greatly improved by it.

After this they are to be used in the same manner, and on the same occasions with common dunghills, and it will be found, that they will go farther than in the common course of business. Eight load of this dung, if there have been a tolerable mixture of the sea mud, will go as far as ten of any other, and this is no small advantage.

#### C H A P. LIV.

##### *Of the use of lime water as a manure.*

It is with pleasure we see the farmers begin to use their reason more than their fathers did, who were carried in all things by blind custom; and consequently prevented the improvement of their art. At present the advantages of new methods are so plain, that they are no longer terrified at them under the name of projects: they not only adopt what is proposed, but invent new practices themselves. What we have here to relate of the use of lime water is one of these improvements, and is owing to the sagacity and spirit of a farmer who is a benefit to his country, and an honour to his profession.

This person had a piece of pasture ground near his house which was of a good soil, but had the inconvenience of being subject, in an uncommon degree, to worm casts. He had heard of lime as a destroyer of worms, but this was not all which induced him to the experiment. He had read that lime will give virtue to four quantities of water one after another. Upon this principle he proceeded. He ordered a large quantity of lime to be put into a tub, and water in abundance to be poured upon it. The next morning this water was drawn off, and labourers poured it down by pailsfulls in different parts of the ground. This was when the grass was taking its first growth for hay; and the worms were most troublesome of all.

More water was poured upon the lime, and used in the same manner a second, third, and fourth time, and the effect not only was very great in destroying the worms, but the grass grew thick and full in a very surprising manner.

The farmer the next year, instead of doing this in spring, poured on the lime water as soon as the first crop of hay was carried off the ground, and after pouring the three waters on at two days distance each, he had the last quantity used lime and all.

The lime was by this time reduced to a powder as fine as that for the hair; and stirring it up with a stump broom, the water was taken out thick with the powder. This was poured on as the rest; and no manure was ever so equally distributed over a field: the consequence was a quick and strong growth of the leaf, and he had a very good second mowing.

The labour was considerable, but the advantage very well answered it. In all these cases one must be computed with the other, and the charge is never to be regarded when the produce makes amends.

Our farmers have long been kept at a low ebb of profit, by the fear of venturing their money in bold improvements: but if these be conducted with knowledge, there is nothing so advantageous. I have known many starve upon their common course of business, but I never knew one instance of money being properly laid out upon land, but it returned the advantage many fold.

The owners of land are interested in this particular more than those who rent it; but both sufficiently. The late improvement of estates in the north of England is surprising; and the benefit has been deferred to the present age, partly because agriculture was but ill understood, and partly



partly because there wanted spirit to advance the necessary sums.

This is a general doctrine, but it is not a little applicable in the present instance, wherein nothing but the price of labour can prevent the extending the practice; by which alone it can be known, whether what was a particular benefit in the instance just named, can be made a general one. Experience in more cases will shew this plainly.

#### CHAP. LV.

##### *Of brewing malt liquors in the most advantageous method.*

WE have in the preceding volume given directions for the choice of malt, hops, and water for the several methods of brewing; and need not here repeat any thing on that head: but as the Dublin society have published some useful observations on this subject, and something has been done in the way of improvement by our correspondents, who have tried the methods unproposed: what has been advanced from these two sources we shall now lay before the reader. It is by these means useful knowledge may be best increased; and in this and the other articles of the present volume, which depends principally on the experience of our correspondents and others, since the publication of the first, it will be our care to admit no article but what is conformable to reason; and comes well supported by experience.

It is a certain truth that nothing tends so much to improve malt liquors as proper boiling; neither the virtues of the malt nor of the hops rise in vapour. Therefore there can be no loss of strength, or any other useful quality in the wort by boiling: and the advantage is most evident.

This fact that nothing is lost by it, has been lately proved by the most certain experiments. If a quantity be boiled in an alembick or common still, instead of a copper, the distilled liquor is nothing but water. Therefore, in the boiling in coppers, nothing but the watery part is evaporated, and the liquor gains strength without losing any good quality.

For this reason all methods should be used which conduce to the full boiling of the beer, and we are to acquaint the reader, that the largeness and depth of the copper is one. It is proved by experience and careful observation, that the smaller the quantity is which is kept boiling, the more it evaporates in proportion. Now there is but a certain quantity that can be permitted to be evaporated, and as this will be done sooner in proportion in the small than in the large copper, it follows plainly that the beer cannot have the same advantage of boiling in small quantities that it can in larger.

The world has been long perplexed about the nature of that particular and excellent malt liquor called London porter; and many reasons have been assigned why it cannot be made in private families. This article of boiling, which has not before been taken notice of, is one.

The peculiar and excellent quality of porter depends, in a great measure, upon the full and thorough boiling; and therefore, in consequence, it depends, in a great measure, upon the vast quantity which brewers make at a time.

The perfect incorporation that is made of the meal of the malt, and in some measure, even of the coat, in porter, can be no otherwise attained than by a very strong boiling. Now upon the principles already laid down, the brewers have this advantage over all private families, that they can give the liquor a boiling the others cannot, because the same proportion of the liquor will be evaporated in a small copper in four hours, that would be in six or seven in the brewers vast ones.

It is for this reason, that beside all other considerations, porter can never be made to perfection by any but those who make great quantities at once. We have before observed, that to come to its true quality it requires also long keeping.

These are articles which the brewers chuse to keep secret; and they therefore are fond of talking of the particular qualities of Thames water. It is to their interest to lead those, who would rival them, upon a wrong scent: but beside the advance we make by this means toward a discovery in the brewing of this excellent liquor, the fact is general; and being understood, will tend to the improvement of all kinds of beer.

It may be possible, perhaps, to invent the means of obtaining this advantage in private families, now we know the importance of it. The reason malt liquor cannot be boiled so long in small coppers as is requisite to its perfection, is, that it wastes too fast by evaporation. This may be prevented in part by covering the copper, and by this

means we may have it in our choice to give any quantity a full and due boiling.

A tin cover, made in the shape of a very large funnel, would answer this purpose extremely well, and by giving the opening what breadth we please, the evaporation would be restrained, moderated, and managed, in all respects, just as we chose. If this cover were absolutely close, the liquor might boil ever so long without evaporation; and consequently, according as it is more or less open, the evaporation will be quicker or slower. It may also be easy to moderate the heat of the liquor by keeping a refrigeratory round the funnel-shaped cover of the copper, filled with cold water, in the manner of those which are made about the heads of portable stills; what effect the moderating the heat, by returning the evaporated part in drops perfectly cold would have, is worth trying; and by these, and the like means, we may render that a certain and regular process, which has been hitherto an arbitrary proceeding, which they, who practised it best, did not at all understand; and which was kept therefore out of the reach of all improvement. It has been so in most articles of husbandry, and it is so still in regard to the greatest number of things in family economy. We hope the spirit of improvement, which has been so successful in one, will be extended to the others.

It is said, that if hops be distilled alone, the water will have a flavour from them. It is not their bitterness, for that is a quality which chymists know never rises in the still; nor their roughness, which is also as incapable of impregnating a vapour, whether it be from this or any other ingredient.

Whether it be fact that the hop will yield a flavour distinct from these when it is distilled alone, we cannot say, not having made the experiment; but it is certain that when in the malt liquor it will not.

We mention this doubt, because the ingenious author, who has written on this subject in the Dublin memoirs, thinks it can: and it may be proper to observe, that in an article of trying the qualities which will rise in distillation, a great deal of accuracy is required. It has been asserted by a great French chymist, against the general doctrine that bitters do not rise in vapour, that the distilled water of colocynth is bitter. But I have heard an Englishman of as much knowledge, and perhaps more care in operations, assert that this was an error. He had also distilled colocynth, and the water was tasteless.

This gentleman suspected, that the French author might have been deceived by the nose of the instrument being touched by colocynth, and a small particle or two sticking to it which would give a bitterness to the water: and perhaps in the present instance, though a very fair trial in all appearance, may have been made, yet the oil of some former distillation may have remained unobserved in small quantities in the head of the still, and have given the flavour supposed to arise from the hops. The gentleman who mentions the experiment says it was made with a still. If it be repeated with a new retort or glass cucurbit and prove so, there will be no room for doubt.

The practical brewer will pardon this particularity in the enquiry: it is by these accurate trials we arrive at the real knowledge of things; and we are labouring for his service.

Those who have considered these several qualities in the hop, have supposed it would be better to obtain the fine flavour, and the delicate bitterness from it without the austerity or roughness; and it is said that less boiling of the hops will give these, and that therefore longer boiling of this ingredient should be avoided: but it is certain that hops have more boiling in porter than in other malt liquors, and the effect is a great improvement in the drink; and there is no arguing against known experience.

It is affirmed also that long boiling evaporates the fine flavour of the hop; and leaves only a coarse bitter and a rough taste: but this is said of hops boiled alone in water. It is otherwise in regard to those boiled in malt liquors, which are of a tough nature, and entangle and detain those particles, which perhaps would be lost if the hop were boiled in water alone. If the case were absolute, and that long boiling was useful to the malt, and prejudicial to the hops; these might be put in afterwards; or the method we have proposed of having a cover to the copper would prevent the evaporation of that oil, which is supposed to contain their high flavour: and by these or the like means, the malt might have that degree of boiling which it requires, and the hop no more than was judged proper to obtain its virtues.

These are points which deserve particular attention: for the art of brewing is very imperfectly understood, and there



is no way beside to get at the true method of improvement. Experiments will best determine whether or not the hop should have a great deal of boiling; but we are sufficiently assured that the malt should; and if it prove that the same boiling which is useful to the one is hurtful to the other, it will be very easy to give the due proportion of time to each as we have directed.

In the beginning of this chapter we have observed from repeated and constant practice of the greatest brewers, that to give the full strength of the malt, there requires a great deal of boiling; and we have given a method of reducing the degree of heat in case that should be necessary, by condensing the vapour in the cover of the copper, and returning it cold into the liquor.

By this means, and by a due regulation of the fire, the liquor may, at the pleasure of the brewer, be kept at the utmost heat under boiling. The two methods of long boiling, and long stewing in this manner, should be fairly tried to see which produces the best beer. We are absolutely uncertain in this point; and there is the more reason to bring it to a fair trial, because what is now said to be the general practice of brewers, declares in favour of the long boiling; and the ingenious author of the Dublin observations is of the opinion, that the other is the true method. What that gentleman advances is very probable from chemistry; but we have better foundation when we depend on facts. The trial is easy; we have recommended it to some of our most curious correspondents, and wish it may be also fairly made by others.

This gentleman, who is so much an enemy to boiling, says, that it dissipates the spirit of the malt: but this is a point easily brought to the proof, and we apprehend will go against him: for it does appear that no spirit can be made from malt by simple boiling; fermentation is required for that purpose, and all the boiling of beer is given before fermentation.

Therefore no strength of the liquor is lost by boiling; and a great deal is obtained. It is true, that if beer be boiled to an extract, that will be tough and gluey; but the boiling given in any way of brewing does not amount to any thing of that kind: it only extracts the full strength of the malt.

Whichever way this question, as to the boiling the liquor a longer or shorter time, shall be determined; it is certainly a right measure to infuse it first, for the mazy part of the malt is thus softened by degrees, and impregnates the liquor much the more strongly in the boiling afterwards.

The author, whose opinions and observations published in the Dublin papers occasioned this chapter, is of opinion, that long mashing are as hurtful to beer as long boiling. We have been the more particular in this matter, because the experience of our correspondents in some things contradicts, as it in others confirms his opinions: and have stated the whole before the candid and judicious reader, that it may be discovered by different trials, whether long mashing and long boiling have, or have not the good effect attributed to them; whether the hops gains or loses in the flavour it gives the beer by a length of boiling also: and at what time it is best put into the liquor.

#### CHAP. LVI.

*A cheap and easy way of calcining clay to serve as a manure.*

THE value of clay, when calcined or burnt to a certain degree for using as a manure, has been explained in the preceding volume; and as nothing need be added to convince the farmer, it is a kind highly deserving his consideration, all we can have need to add here is, that we have repeated proofs that what is there said of it is true. It must be therefore very desirable to him to know in what manner he may burn it at least expence, and this is a subject happily treated in the memoirs of the Edinburgh society.

Clay itself is in a manner universal; and all that can be desired to extend its use, is this easy process of preparing it.

Mark out a piece of ground forty two foot in length, and twenty two in breadth, in some waste place near the ground where the manure is to be used, and near where the clay can be dug with ease.

Upon the piece of ground which is marked out, draw by a line nine channels four foot asunder, and sixteen feet in length. The surface between these must be levelled, and they must be dug six inches deep and the same in breadth, they will thus be four foot asunder, and the whole surface level between them.

Make four channels across these nine at four foot distance,

and clear them to the same depth and breadth with the others; lay the turff and mould, that is cut up in making the trenches, in the middle of the squares that are marked by the trenches, and then cover the trenches themselves with thick tiles, or bricks.

They must be left open where they cut one another, for these parts are to serve as so many chimnies, but every where else they are to be covered up as close as possible.

Draw a part of the stuff close to the bricks or tiles to keep them in their places; and then raise a kind of wall between every two trenches of the dry turffs. It must be a yard high; but it requires no more thickness than will be sufficient to keep it together.

After this is done, build the walls at the ends with wet clay; and leave a hole at each of the channels for lighting the fire. This wall need be no higher than the others, but it should be a foot thick.

Over each of the holes where the channels meet, raise a chimney of loose bricks two yards high; and secure it on the outside with some wet clay.

Then lay straw over the channels, and over that some faggots: lay in so many as will fill up the spaces between the walls to a level with the walls themselves, and then build up also walls of clay at the two sides in the same manner with those at the ends; and leave a hole of nine inches over each channel, as in the former work.

Cover the whole with some good faggots, and fill up the spaces between them with fern or any small stuff, to make the whole a tolerably compact and even surface. Then carry up the four walls at the ends and sides as high as these faggots have raised the whole work, and it will be in a condition to receive the clay.

Let this be dug in as large spadefuls as can be, and lay these evenly upon the top of the faggots. The covering of clay must be two foot thick, and it must be laid tight and close that the fire may be thoroughly well kept in: for if it gets passage any where it will waste itself very soon; and without perfecting the intended operation upon the clay.

Beat up some clay and mould together with water, and when it is soft enough to be conveniently managed with a trowel, plaister the outside of the walls with it very thick from the ground, up to a yard in height. By this means the clay of which these walls are made, will have its share of the heat, and will become as good manure as the rest. When all is thus prepared, bring a good quantity of clay, and lay all round the building: twenty load or more may be brought for this use: it is to be thrown on wherever the fire breaks through, and will by this means be calcined as well as the rest, at the same time that it answers the purpose of keeping the whole in order. Make an opening of a yard long from the end of every one of the trenches. Let it be as broad and as deep as the trenches; but it need not be covered.

When all is thus ready, let the fire be lighted at break of day, that there may be the whole day for management; and let it be done in this manner. Observe which way the wind blows, and then prepare to light it: let all the other openings of the walls be stopped up, and in those which face the wind, set fire to the straw that lies over the channels. This will begin the fire, which will presently spread over the whole place; the faggots and every other part kindling: and the clay stopping up the places where it would naturally burst out into flames, it will continue burning in the intended slow and smothering manner.

Wherever there appears a crack in the top, let a quantity of the fresh clay brought for that purpose be thrown on, till it is entirely stopped; and thus this part will be calcined as well as any other.

As soon as the fire is well lighted, all the holes in the walls over the channels must be stopped up; and a person must be employed to go round continually, to see whether there be any crack where the smoke issues out: this must be stoppt in time; and thus the heat will do its office; and the clay which covers the work will calcine through its whole substance, in a gradual and regular manner.

As the fire continues to burn, the materials will waste, and the bed of clay which covers the top will sink in an irregular manner, and in various places. This will occasion more and larger cracks, and these must be covered with fresh clay, in the same manner as the former: but there must be a less thickness of it laid on, in proportion as the fire is grown weaker.

In ten or twelve hours the whole will be sunk so, as not to be above a yard high from the ground; and then that part of the clay which lies upon the cross walls, must be thrown in, especially that which is least calcined; and it should be thrown where the fire bursts out strongest.

If any part of this construction burns dull, let a hole be opened



opened in it; and the channel stopped up, which is opposite to it: and it will soon burn. When the clay brought to lay upon the cracks is all used, more must be brought for that purpose; and the whole, with the side and end walls, will thus be reduced together to a most excellent and valuable manure.

All the time this burning is continued, let fresh clay be brought ready to throw on when wanted; and let the walls and channels be kept in good order; the walls upright, and the channels free and clear from dirt: and let the chimnies, as the work advances, be always kept six inches at least above the level of the surface. By this means, and by constant attendance, the walls and the whole mass being kept in order, there will be no difficulty. If the fire be at any time exposed to the air, it will presently go out; therefore constant attendance must be given it day and night. The least cracks will shew themselves: for in the night there will be a white or greenish flame from them; and in the day they will be black at the edges. These must be stopped as they appear, as we have directed; and if this attendance be given, there will be no doubt of success; but carelessness may undo any purpose.

If the clay be burnt in a rainy season, the work should be done upon a rising ground; or if at other times rains come on, there should be a hollow sunk, with a spade round it, that the wet may run off.

When the whole is raised to twelve foot in height, the work will not well admit any farther quantity, as a man cannot throw up the clay from his spade higher; let it remain till the fire burns out through the top and sides, and then pour on forty or fifty pails of water. Thus is the work accomplished; and in this manner, including every article of the expence, two hundred loads of clay may be burnt for about four pounds; it has been said less, by those who published the method, and perhaps the computation may be as exact there, as the present is for our part of the kingdom. If it were done at much greater expence, it would very well answer to the farmer; for there are few manures which take greater effect, or more lasting than this, when it is used with judgment, and upon a proper kind of ground.

#### CHAP. LVII.

##### *The best way of using burnt clay.*

**T**HIS manure is excellent for pasture and corn lands, and answers upon both the essential purposes of destroying weeds and insects, and promoting the growth of the crop: on pasture ground it has also a peculiar quality of altering, in some degree, the produce; for it never fails to bring up that excellent kind of grass, the white trefoil or clover, which makes a fine bottom, without injuring the growth of the rest. There will not be one blade the less of the grass for this, though the clover perhaps, if weighed, would amount to a third of the quantity; and is a more nourishing food for cattle, and perfectly harmless.

The farmer is not to think these plants are formed spontaneously out of the mould, as mushrooms were once supposed to grow out of the wood; and rats from the mud of rivers; but the fact is this. Winds blow about the seeds of this plant, which is common upon waste grounds, and they are scattered in various places. Where there is a proper soil they will grow; otherwise they lie in the ground, or under cover of the grass upon its surface a long time.

The burnt clay gives them the proper and favourite soil; and they never fail to spring up. As soon as the plants have got footing, they increase abundantly; running at the root, as well as ripening numerous seeds: and thus the bottom is covered, as if the plant had been sown.

For this purpose the clay should be burnt in November, and the ashes spread upon the ground the following month, to the quantity of thirty, forty, or even fifty load to an acre. The worse the condition of the land, the more of these ashes are required; but this may be allowed, as they come cheap; and there need be little carriage, because they may be burnt very near the place. The weeds will thus be destroyed, and this excellent plant will take their place.

The clay must never be used, unless when it has had the proper degree of burning; and for this reason, when the work is taken to pieces, if there be any parts of the top or sides which are not so well done as the rest, they must not be mixed in, but piled up in heaps by themselves, and burnt over again, with a small quantity of furze, or other light stuff, as is done in burnbaiting, and such practices. In all these cases, let the farmer do his business thoroughly, and he will never be disappointed; but if he works by halves, he must not expect the whole advantage.

In regard to plowed land, the best and most advantage-

ous method is, to lay this manure on a summer fallow, and sow turneps; then corn. The turneps, in this case, always stand a better chance than in any other, and the ground is got into a fine condition for the corn.

The farmer should, in all things, suit his work to his occasions; and it is in no article more necessary than in this: for the great value of clay burnt to manure, is, that it should be used immediately from the fire; therefore, when this is the case, let the work be raised near the field where it is to be used, and the operation performed in May. In June let the ashes be spread over the fallowed ground, in the quantity of fifty loads to an acre, and then the turneps sowed. They will come in at a favourable time; and if the ground be naturally too wet for the cattle feeding on them upon the spot; or if unfavourable seasons make it so, they may be pulled up, and given under cover. When the ground is naturally wet, the farmer should prepare against this accident by ridging and water-furrowing: and in that method, unless a dropping season increase the mischief, they will probably feed very well upon it.

The burnt clay, in this management, is excellent for cold, wet, and tough grounds; but this is not the only way in which it may be used with advantage. It may be burnt in autumn, or in spring, for the same kind of service, and spread upon the ground immediately; after that it may be plowed lightly in, for the sowing of the winter or summer corn, either of which it helps alike.

All ashes are useful in the manuring of land; but those of clay most of all. The ashes of the turf in burnbaiting; and those of ant-hills, when cut up and burnt for that purpose, all give great fertility, but none of them like these: none so sudden, nor any so lasting.

#### CHAP. LVIII.

##### *Of the caution to be used in the management of land.*

**W**E are come to a period when the practice of agriculture is, in some branches, so well understood, that there may possibly be danger from the farmers too great knowledge in them, unless the land-owner has also some consideration.

The old way of preventing exhausting of land by cross cropping, by inserting proper terms in leases, has been found extremely necessary; and perhaps more of this caution may be required, as the improvements continue. No encouragement can be too great for those who mend land by draining, banking, inclosure, or lasting manures; or for such as introduce new species, or discover better and safer management of the old; but there is a wide difference between those who improve the land, and such as only find the methods of raising temporary crops, which leave the soil much worse than they found it. These secrets have been known in the earliest times; but men have been too wise to practise them on their own lands, and too honest to use them on others. Nothing is an improvement that is not lasting; and the benefit should be judged not by one year, but the succeeding condition of the ground. This is an article very worthy the attention of those societies, which distribute premiums for the encouragement of arts; for excellent as they are in their institution, they may otherwise pervert the very ends they were established to support; and under the shew of improving, injure their country.

It becomes us to use all honest freedom on this occasion: The Dublin society are a very honourable set of men; and they proposed their reward for the raising the largest crop of wheat with the most upright intention; but they should have added, that *it should be done by means which would not damage the land*. And for want of this, they have given occasion perhaps to great mischief.

Mr. Yelverton obtained their premium upon the most reputable terms; for he produced a vast crop; and they had made no restriction as to the means: he was therefore at liberty to use any that he pleased; and he united all that are to be found in books of husbandry; not only those which promote the crop, but those which are known to hurt the land.

Early in the preceding volume we gave the method of burnbaiting, and observed, that great good management was required to prevent the damage which succeeded the immediate benefit of this practice.

Burning the surface is a certain method to produce one crop vastly superior to what the land would yield otherwise, but this renders it still vastly worse afterwards. It was always a known practice; but it was for this reason limited to the most barren lands. Mr. Yelverton applied it to a piece of ground, which was far from being of that kind, and which had lain unplowed thirty years. He obtained a great crop by means not proper to be used; and it would be a general



neral misfortune, if this part of his practice should be followed.

The field, which had by this long rest come to the state of almost virgin earth, was in its nature loose and mellow; these are the express terms of the description, and there is no doubt but such a piece of ground would, by the common management, have yielded large crops, without the destructive article of burning; which was sure to impoverish it for succeeding years, and could answer no other purpose, than the obtaining one great crop as a prize; and for the glory and additional advantage of reward. There is no doubt, but Mr. Yelverton obtained a greater advantage from the ground that year, than he could have done by any other means: but this was all that was obtained; and this was not what the society intended. They meant to promote the good of the country, not to hear a trick of one year's continuance; and it is so certain that this tends to do mischief, instead of the good they intended, that if all the farmers in England were immediately to follow the same practice, the consequence would be a great and dangerous reducing of the value of lands, and probably a famine. The gentlemen of property are interested in the first of these articles, the publick in the latter. It is their business to produce an equable and uniform improvement; not a temporary advantage, with lasting inconveniences.

We have named by what manures, and by what timely use of them, land which has been burnt may be continued in heart; but where these manures are not to be had, or where the ignorance, idleness, or dishonesty of the farmer, prevents his using them in the proper manner, it is certain that the effect of one crop, like Mr. Yelverton's, will be many years of lasting and terrible barrenness on the same land.

This is of importance; and let us examine it thoroughly. Mr. Yelverton's land was not such as any man would have dressed in that manner for any other purpose, but that of obtaining one year's great advantage; and he owed the crop and the reward to his bad practice.

The other articles which promoted his crop, were what all farmers use; change of seed, and due steeping it in brine. The effects of both these we know are good, but of neither wonderful. Therefore the crop, which was indeed wonderful, being, I believe the greatest ever procured from an equal quantity of land, must be attributed to the burn-baiting.

Mr. Yelverton obtained the prize of the Dublin society, for burnbaiting a piece of rich, loose, mellow ground, which had not been broke up of thirty years; that is, for one great crop he damaged a fine piece of land for ten or twelve years: for this is the absolute fact. The richer a piece of ground is, the more it is hurt by burning, because it burns away more than a worse; and any man who intended a real improvement, would have most carefully avoided that practice. This is the plain and exact state of the case, that gentleman obtain'd honours and rewards, for a practice which impoverished the land; and which, if followed by others, would be a great disadvantage to the kingdom.

The mould upon this land lay thin, and was but in small quantity; and the burning the surface must have absolutely destroyed a considerable part of it; this damage is evident; and it is one of those not easily repaired. The small remainder, in such case, must be exhausted almost beyond reparation, by supporting one luxuriant crop, such as would be sure to rise from so fine a piece of ground burnt.

In shallow and rich soils, the contrary practice, in all respects, should be observed: immoderate crops, any particular year, should be feared; and instead of burning away a part of the soil, all the address of the farmer should be employed to encrease its quantity. If this gentleman had laid on pond mud or marle, he would have obtained great crops, and lasting benefit; and there would have been more honour in deserving the premium that way, than in winning it the other; it would have set an example, which they who had followed would have at once enriched themselves, and served their country. It is a great honour these societies do to the present age, but nothing is perfect in its first establishment. It was an ideal wisdom that came perfect from the head of Jove: in human things, time and experience bring this finishing excellence. Hereafter we may hope the means will be considered in the distribution and appointment of premiums, and the lasting good of the country provided, rather than the particular benefit of an individual.

In regard to the burning of soils, the rule is absolute and plain to reason. The deep soils will bear it better than the shallow; and it should never be permitted but in bad grounds, nor ever without a covenant of certain dressings afterwards.

## CHAP. LIX.

### *Of the application of dung.*

IN the dunging of pasture grounds, beside the general direction of breaking the heaps, and spreading them evenly on the surface; it is a very good rule to bring none near the hedges. The omitting the manure to the breadth of eight foot from every hedge, will considerably reduce the quantity, especially in small enclosures, and consequently lessen the expence; and the grass will suffer no damage for the want of it in those places; because the cattle will do the business for their owner.

These creatures love to lie under the hedges; and the warmth and perspiration of their bodies, with the dung and urine which they drop principally in these places, because they are most of their time there, will very well compensate the omission of dung laid upon the other parts. It is a common observation, that the grass is more rank near hedges than elsewhere, and this is the reason: the farmer gives this part of the ground the same quantity of manure with the rest; and the cattle give it so much more. He will, by the practice we direct, save a great deal of expence, and make the produce equal.

Not only the nature of dung differs according to the various animals from which it is produced; but the dung of the same animal is different under various conditions, according to its strength and situation.

Physicians who prescribe horse dung on certain occasions, always are particular in directing that it shall be the dung of a stonehorse. The creature in that condition having more strength and vigour, and consequently the dung having more virtue.

We know that the nature of the food, in a great degree, determines that of the dung; and it has been supposed that the dung of the stonehorse was better than that of other creatures of the same species, because he was in general better fed than they; but we see by the farmer's experience, that the dung of the same creature feeding upon the same food, will be of a different quality, according to the state of the animal's body.

It is known, that the dung of horned cattle is much poorer and colder than that of horses; yet that of the ox is preferable to that of the cow. Bulls are kept in small number, so that their dung cannot be saved or tried separate, else doubtless it would be found better than either. But this is not all: the dung of a cow which is fattening up for the butcher, is much richer than that of a milch cow. This last is the poorest of all; and repeated experience shews that it scarce takes any effect upon the land.

The dung of sheep being naturally hot, that of ewes is preferable to the dung of weathers. The richest sheeps dung of all is that when the ewes have the lambs in them; and in general, it is with the sheep as with other creatures; the more dry food they have, the finer and more valuable it is. The improvement of this dung, by means of loamy or other earth in the cover'd fold, we have named; and something of the same kind is advantageously performed with pigeons dung in many places. They strew a large quantity of malt dust on the floor in the dove-cot, and when this is well covered with the dung, they throw on more. They thus double, or perhaps trebble the quantity of manure, and render it more easily manageable, without greatly impairing its value. We name this for the sake of an improvement, which has been lately made in the practice, and which, without abuse, may be of great value. A gentleman in Suffex, who depended very much upon his pigeons dung, found his dove-cot empty day after day, not only of dung, but of the pigeons themselves. Some neighbour more wise than honest, had found the art of decoying them away. He had read of the fondness these creatures have for cummin seed, and he mixed a considerable quantity of this in powder among the malt dust, which he strewed upon the floor; he moistened this with strong brine, and left it to its consequences: the few pigeons which yet came to his dove-cot returned the next day with more; the number encreased from time to time much faster than it had diminished; and though, without his desire, he soon seemed to have more pigeons than properly belonged to him.

The farmer needs not be told that cummin seed and brine can do no harm to the manure: what effect they have will rather be in the way of enriching it. This is a method one would by no means wish to see practised to an ill purpose; but some art is needful to those who live among ill neighbours.

There need be no limitation in the quantity of malt dust, for that is in itself an excellent manure. When it is used alone,



alone, the quantity should be twenty bushels to an acre. The time for laying on is February, when the wheat is making its spring shoot; it will thus give a lasting virtue to the land; and though it have been neither dunged nor sowed, the wheat will be a good crop, and it will be capable of bearing barley afterwards. Cold clayey soils get the most good from this manure; and it is of equal value for these soils, whether they be in pasture or tillage. The time to lay it on in either case, as near as the farmer can guess, before rain; for if a dry and windy season follows, the ground will have scarce any advantage from it. The time we have directed for laying it upon the spring corn favours this, for there is much more reason to expect rain than heat at that season; and wind without heat will do little damage.

For grass grounds it must be laid on a little later: the time when they are going to be laid up for hay is very proper; and if it be done before the last rolling, it will be the better, for that will press this light substance close to the ground, which will have the double benefit of preserving it from winds, and exposing it to the rain.

#### CHAP. LX.

##### *Of the management of wheat straw.*

**T**HE farmer will succeed best who regards all articles in time; and makes provision in abundance for seasons of deficiency. This is to be extended even to the least articles, not only to his corn but his straw: particularly to wheat straw, which has many excellent uses beside the common service to which it is applied; and is much fitter for many of those purposes in some years than others.

Wheat sometimes runs very much into straw, and less into ear; at other seasons the ears are in general large, and the straw is short: often also it is blighted or otherwise damaged.

In those years when straw is long, sound and fine, it should be saved for seasons when there is little or none good, and when it will be much wanted. It is worth while to rick it on these occasions; and it will keep so, good two or three years. At the end of this time, what has not been wanted for better purpose, will serve excellently as litter for dung; because, though it keeps its firm coat all that time, it will rot more readily and more perfectly by means of the fermentation with the dung and urine, than it would have done while fresh.

The uses of good wheat straw are very important.

When pease or barley are obliged to lie any time in the rick unthatched, a few loads of this thrown over them answers the purpose.

In preparing straw for thatching, there is a necessity of watering it in such a manner as to make it supple in the hand, and dispose it to lie close in the place; this is often done very imperfectly, and in consequence the work is of little duration. There is no way to make the straw take wet well, but by beating it in the heap while it is sprinkled. This must be done with a careful though a free hand: for if it be done irregularly or lightly, the purpose will not be answered; and if it be done too roughly, the knots will burst, and the straws crack between them; and the thatching will decay much sooner than its natural time.

In the laying on the thatch it is customary to use withs of osier twisted to bind it; but there is in many places an opportunity of a much better practice, where old sea ropes are to be sold, as they are in many parts of England, these being tarred will bear untwisting, and they are then much fitter than the withs for that service. They will bind faster, which is often of very great consequence, and they last much longer, which always is so.

#### CHAP. LXI.

##### *Of foddering of cattle.*

**H**ARD winters bring on a necessity of this expensive article; and the farmer should be upon his guard to delay it as long as he can with safety to the stock; not only because all that time is saved in the price of fodder, but a great deal more; for when they have been accustomed to fodder, they will not make shift with the same food that would have served them, if they had not been brought to the use of this. Therefore it is essential to keep them from it as long as can be done without absolute damage to them; and when it is first given them, to let them feed partly on that, partly on what fresh meat remains. There is a great deal to be saved by this cautious management; and the farmer's savings are his best gain.

The cheapest hay is also properest for this purpose, for the same plain reason: no farmer would by choice feed

his cattle upon what he could readily carry to market; but in this also, a great deal depends upon right management. When the cattle find great scarcity abroad, if they be offered some of the most indifferent hay, they will feed gladly upon it; but if he begins foddering with what is better, they will not readily touch this afterwards.

Another rule, in regard to this indifferent hay is, that he give it a little at a time only, and that when they are sharply hungry. For if he give them a surfeit of it they will never touch it afterwards. If he force it upon them, in the same manner, when they are indifferent about eating, they will disgust it; and refuse the same food afterwards, even when they are hungry.

When we advise the farmer to use an inferior kind of hay for fodder, we do not mean that he should make shift into hay, for this purpose, which is unfit for it; or that he should give bad food to valuable beasts: which is often attended with very ill consequences. Moderation is the rule in this as in all his other proceedings. If he should give sour, musty, rushy hay, to creatures that had been accustomed to better food, they would fall into disorders; and perhaps die by it.

These, which we have laid down, are the absolute rules, but he must follow them with discretion.

Cows will eat straw freely, and thrive very well upon it, unless they be accustomed to hay; but in that case they will refuse the very best straw afterwards; and the farmer must submit to feed them in this expensive manner, or to starve them.

He must not expect cows to eat after one another, or that one creature which chews the cud will eat what another has left; but theavings are not waste, for though these will not eat them, the other kinds will.

A great deal of caution must be used in regard to the time of turning cattle out of the yard where they have been foddered, into grass; for if there be not a sufficient growth for their support, they will decline very soon. It is a common error to turn them out too early. The farmer, if he will use his eyes, knows when there is and when there is not what may be sufficient for them, and he should see that there is before he leaves them to trust to it.

When frosts come on in the beginning of winter, and the grass in pasture grounds hangs covered with a white rime very late into the morning, the farmer should fodder his cattle early, that they may not be tempted to eat the grass in that condition. It is not wholesome for them; and nature, their true director, gives them a distaste to it; but hunger, too powerful for the voice of instinct, often is obeyed; and they are extremely hurt by it. While the farmer is attentive to them, some part of the mischief will be avoided, for if they have a little dry food early, they will be patient till the remainder of the white frost is melted off by the sun, and they will then eat with a fresh appetite: for this icy matter which is harmful while it is on the leaves, is of great use as it melts, giving the blades freshness and the roots an immediate shoot for growth.

We have observed that there must be great care in the first giving this dry food in winter, because when the foddering is begun, the cattle expect it should be continued; but in this method of giving it a little at a time and early, there is no danger; for the fresh bite of the grass soon after is so pleasant, that they are at least as well pleased with it as with the fodder, and consequently do not long after it as on other occasions.

In the choice of straw for fodder, the farmer should always prefer that of the latest crops. The longer the crop has stood upon the ground, the more juices the stalk may naturally be supposed to have drawn, and the later the harvest is got in, the less power there is in the sun to exhaust the small remains of juices in the stalks as they lie upon the ground. This, which is the testimony of experience, reason also confirms.

There are kinds of grain that require but three months in the ground from the sowing of the seed to the ripening of the ear, and some even less than this: in these kinds it is plain that the stalk cannot attain that perfection and strength, that it will have in such as are nine or ten months in growing. Accordingly we find the straw of these several kinds valuable nearly in proportion to the time of their growth: that of least value among the better grain, is the straw of the early ripe barley.

The observation is not limited to the corn kinds, but we find it even in pulse. The vetches which are sown for fodder, should always be of that kind which is known by the name of winter vetch or stretch; for the stalks of these have incomparably more strength and nourishment in them than those of the summer kind; the case is the same as between the corns which take a long, and those which have



a short growth. The longer the stem of a plant lives, and the more nourishment it receives, the better it will be at the last in drying.

This is most plainly the case in those kinds of plants, wherein the same species may be sown in autumn or spring; for then the season of sowing, as it gives the time of the plants remaining in the ground, gives also the strength or weakness of the fodder. The summer and winter vetch differ only in this circumstance; for the species is the same in both: yet we see the consequence, that which has grown through winter has more than twice the strength of what has been produced in spring. This must not appear wonderful to the botanical enquirer; for the distinction between annual and perennial plants is not so absolute as many imagine. The same plant that is annual here is often perennial in its own country; and we find in gardening, that many of the plants which are found to be annual with us, will yet be produced from cuttings; which shews that they are so far of the perennial kind, that if they do not exhaust themselves by flowering, they are very well able to stand through our winters.

In the giving cattle fodder in the fields; the best method is by means of moveable racks: for the dung of the cattle is by that means scattered over the ground as regularly as can be desired; and this sort of foddering is like folding of sheep. This is the more worth consideration, because the dung of the same cattle, when fed by the rack upon dry food, is richer and capable of doing much more good to the land, than when they feed only upon grass.

The value of the long straw we have mentioned for thatch and other purposes of a like kind: and it is a lucky circumstance for the farmer, that cattle always prefer the shortest for fodder. This gives him an advantage, if he will attend to it, of using the different kinds, and all to advantage.

Another useful remark is, that cattle never fail to prefer fresh thrashed straw to such as has been thrashed some time; and it is always found to afford more nourishment. The reason of this is, that being bruised and broken by the flail, it is easier to be worked upon by their stomachs. This is worth regard, because the thrashing and foddering season naturally enough fall out together, and he must be very negligent who does not make the most of a known advantage, when it so naturally and readily offers itself to him.

## CHAP. LXII.

### *Of the use of oat straw as fodder.*

**O**AT straw has fallen into disrepute on this occasion; but without any real cause: those who have found its bad effects need only have given it in a careful manner, not have left it off entirely.

There is no straw so tough as that of the oat, and accordingly it is found to loosen the teeth, hurt the mouth, and take off the stomach of creatures that are fed with it constantly.

It is not like other disagreeable fodder in this respect. For the worst of those only give the creature a disgust to that kind, and it will readily enough feed afterwards on any other. But oat straw makes them loath all food, and has many times thrown them into very mischievous disorders.

The method to be observed is, to give this not constantly or alone, but at times, and mixed with other food. There is one particular mixture which is now found very advantageous. This is the mixing whin or furze with oat straw in fodder, the sharpness of the furze assists in digesting the toughness of the straw.

The method of using furze for the food of cattle has been long practised in Wales, but is very lately brought into use in England. The furze is to be sown for this purpose, and cut while it is very young and tender. The worst ground will serve for raising it; and being sown in the latter end of March, it will be ready to cut for this service in October.

It must be chopped small and bruised; and then mixt with cut oat straw. The furze alone is a very good food; strengthening the creature more than almost any thing of that kind, but it does still better with a mixture of oat straw; for these two things seem mutually to render one another fit for the stomach. The food of cattle is an article of so great concern to the farmer, that he ought to be attentive to every thing that is proposed for rendering it cheaper. This is one of the new crops which he will do well to introduce into his ground: The poorest land will serve for it, therefore it is raised at small expence; and the use of it as fodder in itself, and especially as preparing the oat straw for that service, is very considerable.

The better the soil is, on which a crop of corn has grown, the better and richer will be the straw for fodder. It is observed universally, that the straw of barley, which has grown on one earth, as they express it, is poor and will starve cattle that are kept strictly to it; and the reason is plainly, because it is on poor and light lands they sow barley in this manner.

What juices these lands afford, are carried up at once to the ear; scarce any remaining in the stem; which serves as a mere machine for the conveyance of them to the grain.

This is the provision of nature for the grain, and it is happy for the farmer, that where the nourishment is scanty it naturally goes thither: but in this lesser concern of the straw, he should know that it is left very defective for the same reason: we would have him understand justly and exactly every part of his profession, and every article of his produce, that he may never place more dependance on any thing than it will bear. This is the way never to be disappointed.

The food of horses in particular is grown to an exorbitant price at this time, and it is the farmer's interest, in the highest degree, to use every thing he can in the place of oats, without damage to the creature.

It is worth his while to consider this in the management of his pea crops, for if pea straw be well got up and housed, especially the straw of the large and late ripe pease, it becomes an excellent food for horses. But this depends so much upon the management of the crop, that it is not to be expected unless due care be taken.

Bean straw will also go down very well with horses, and is good nourishment, but it all depends upon the management; for if this or the other be ill cured, and left to grow wet and dry, musty and mouldy, and rotten; the horses, if used to better food, will not taste it; and if, from being accustomed to coarse living, they will be contented to feed upon it, they will fall into disorders: and the farmer will find it would have been cheaper to have fed with his best oats, than by this means to have endangered the lives of his horses, lost the present use of their labour, and entailed upon himself the expence of farriers bills.

We see how eager the cattle are to crop hedges and eat the leaves of elm and other common trees in those plantations. This may give the farmer a useful hint, and to all such he should attend; for his great profit will arise from making the most of every thing.

When he has occasion, or a reasonable opportunity to shroud or lop elms in the leaf season, let him carefully lay up the shrouds or branches with the leaves upon them. The cattle do not want them then, but there will come a season when food will be scarce, and these will then prove of excellent service. The creatures will be glad of them dry as well as green, but for this purpose it is necessary they should have been dried carefully. If they are left to grow musty upon the branches, they will be disagreeable to them, and will be liable also to throw them into illnesses. The care to dry them wholesome is comprized in a few articles; and the method of keeping is easy. They must now and then be turned till the leaves are dry, and they must be kept under cover till they are wanted. This trouble is all that is required, and the rest is profit; for the wood will answer all purposes as well as if it had never been put to this first use.

There are even weeds, which are avoided by cattle while they are growing, which, by a very little management, become a good food.

The thistles of our pasture grounds are of this kind; and particularly that called the spear thistle. This first makes its appearance in a number of long prickly leaves, which rise in form of a star, and one plant will cover a yard of ground; shading, pressing down, and damaging the soil for that compass; the cattle will not touch this, and there are many pasture grounds, where an eighth part of the surface is occupied by these plants.

There is a very easy way to render them a benefit instead of a nuisance. The cattle do not refuse them because ill tasted, but because they are prickly; and their noses are wounded in attempting to eat them. Let them be cut up in this state, and as soon as they begin to wither, the prickles lose their strength, and the plant may be eat without trouble. Its own juices then recommend it, and those creatures will feed on it with pleasure, which before avoided it though hungry. The time when they are between green and dry is the most favourable for this; and that is easily seen. The prickles, which were the thing that rendered them unfit for eating, are then withered and weak, but when the leaves have lain to dry, these harden again, and will be able to wound the mouth as they did at first. Every one has observed, that between fresh and dry there is a state wherein all the parts of a plant are weak and flaccid:



flaccid: it is at this time the thistle is eatable; and only the young leaves then.

## C H A P. LXIII.

*Of the uses of plants hitherto unregarded.*

THE antients, who had always utility in view, considered the qualities of plants much more than their forms; and botany was subservient to purposes of the highest importance: in later ages, more ingenious but less prudent, the science has been cultivated, and its end, in a great measure, forgot. We have informed ourselves of the names and characters of plants, in regard to classical distributions, in a way much superior to the antients, but this has engrossed, in a manner, all the attention of those who studied them; and while thousands have been added to our catalogues, little has been known of the use, either of these or of those described before.

At present, discretion seems to promise again to blend itself with science, and we see in Sweden, where the greatest improvements have been made in it as a system, the highest attention is now also paid to it in regard to use: the French have caught the same fire; and even in Russia, the advances of knowledge, vast and unexpected as they are, have always utility also in view.

One branch of it has fallen into the way of the authors of this work, which they have endeavoured to improve, certainly with an attention proportioned to its importance; with what success the world will judge.

Hints had been given by others of the value of certain plants hitherto little regarded by husbandmen; and observation pointed out the plain utility of others: experiment was wanted to confirm these opinions, and the correspondence, with which they have been honoured in consequence of the work, by those who study agriculture in various parts of the kingdom, has given them this opportunity.

The experiment, proposed in a former part of this book, of raising sea spurrey for the feeding of cattle upon the heath, where nothing else would grow, has been attended with so much success, that the authors have been encouraged from it to make repeated observations on other plants, which may be introduced in the same manner; and to seek throughout the writings of others, of earlier or later date, for observations of a like kind. Those, however lightly delivered by those authors, have, in many cases, been brought to trial: and where they have been successful, they will be here recommended to general use. Others also will be proposed for trial, from a knowledge of their qualities, and an easy way pointed out to use them. We shall be happy to make the study of plants, in this manner, useful to the publick, and it is thus we rationally are to look for improvements: nor let the novelty be an objection; every thing was new once: clover has indeed been so long used, that the husbandman looks upon it as a natural part of his crop, like grass; but sainfoin and lucern, additions scarce less valuable, are, in England, of very modern date.

Nor let the botanist think the science disgraced by our considering this as its first value. The use of plants in food and physick, cloathing and building, first occasioned men to study them; and it was for the service of these purposes alone, that they were considered by those fathers of the science, whose names we hold in so much reverence: Theophrastus and Dioscorides knew but a few; and were little skilled in the botanical characters even of those, but they understood their uses perfectly. If they had better described them, their writings would have been of much more value, and that deficiency we should supply now.

These uses of plants thus first gave credit to the study of botany, and we should, now we have so much improved the science, shew its value in the same manner; by ascertaining some, and by discovering others.

Even the classical distributions of plants may become useful to the physician and the husbandman; for all those which are truly of the same class, are also of like qualities.

This absolute truth should raise the science into very high esteem; for it points out a value in it more extensive than might have been imagined, giving the farmer and physician at once, a view of many plants, which they may rationally bring into service.

We have not yet arrived at a truly natural method of classing plants, but we make swift advances towards it: this will perfect the science, and will shew it to the world in a high point of view, as to its use. So far as we have fallen upon the true distinctions of nature, the virtues of all those of one class are alike; and knowing the use of one, we are rationally led to those of the others.

Thus all the truly leguminous kinds are eatable; and it is the same in many other instances: the grass kinds are distinguished by characters so peculiar and obvious, that no true botanist can rationally separate them, and these all possess the same qualities. Their leaves and stalks are the food of cattle; their seeds of birds, and occasionally of the human species. CANARY SEED is an instance of the first kind, MILLET and PANIC of the latter. The grasses of a superior order, which, from the largeness of their seeds, we dignify with the name of corn, are the support of the human species. Darnell seems an exception, but it may also be made esculent. The leaves of the leguminous plants are eatable for cattle as well as the seeds; and this might have pointed out early the use of lentils, to those who were acquainted with the tare: yet was that valuable crop long neglected. The common clover, which is a leguminous trefoil, might naturally also have introduced the lucern, and the rest, much earlier than they were. It is indeed strange upon a double score, that these were neglected, for they had not only the stamp of nature upon them, but the sanction of antiquity.

We are yet so far from a perfectly natural method in this science of botany, that even Linnaeus, who has done more than all others for its improvement, separates the grasses according to his artificial characters, into various, not only distinct, but remote parts of his work: these are the imperfections of the study, but they will be removed, and he will deserve still more honour among its professors, who, while he pursues this point, keeps also in his mind at all times, that which is most essential, their real use: examining what kinds, in various countries, are used for food or drink, for physick or for other purposes of ordinary life, down to the utensils of husbandry.

If this had been at all times in the thoughts of botanists, we should, by this period, have been enriched with many useful additions to the common articles of life; for the remotest parts of the world have been searched for plants, and multitudes of species are well known; but not always their uses. Hermon has laid the herbs of Ceylon before us, and Rumphius of Amboyna, Van Rheede of Malabar, Kämpfer of Japan, and Alpinus of Egypt; Oldenland has added those of the CAPE, and Feuillée those of Peru, Hernandez those of Mexico, and Marcgrave of the Brasils; Plumier has acquainted us with those of Saint Domingo, our own Catesby with those of Carolina, and Clayton of Virginia. Tournefort added Greece to the discovered places of plants, and in Europe, Ray, Haller and Linnaeus have given us a most perfect knowledge of those of England, Switzerland, and Sweden.

These are the kingdoms through which science has travelled in this instance, and tho' utility has not been the great point with any of those, to whom we owe these additions to curious knowledge, all of them have not neglected it. Much may be gathered from their writings, and particularly from those of the three last, which it will be very useful to apply to practice. This is the purpose of the succeeding chapters; and we shall be happy, if from the advantageous conduct of the rest of the world, we can add any thing to the wealth and prosperity of Britain.

## C H A P. LXIV.

*Of the herb LADIES MANTLE to be used for food of cattle.*

ONE of the great articles we want in husbandry, is an artificial grass for unfavourable hilly pastures: these, in general, bear a short sweet grass, and are in great estimation for feeding, especially of cattle that have got injury in wet grounds, but the quantity is so small that they produce, that it by no means answers the farmer's expectations. Clover does not succeed well in these grounds, for there wants nourishment to give it any large growth, and hitherto, no better method is known in England to improve them, but by the addition of manures: which they receive very ill, and which their very situation renders frivolous, because the next rains carry them off. The roots of the small crop, which grows there, not being enough to entangle and preserve them.

For this purpose, in Sweden and some other of the northern kingdoms, they sow the plant ladies mantle alchimilla. Linnaeus and his disciples have done vast service to that country, by a careful observation of what they saw useful or hurtful among its products; and to them, probably, has been owing the introduction of this plant into the Swedish agriculture. They observed that large cattle were fond of it; that they fattened well in those lands where it was most common, and that the cows gave better milk. This they learned from the farmers of the country in their travels, and they recommend its culture. The farmers



farmers could tell them what pastures had this effect; and it was their turn then to acquaint the farmer to what the effect was owing. What appeared like magick to the husbandman, was familiar to them, because they immediately saw what plants were peculiar to such pastures as produced this effect; and to these it must be owing.

This reasoning was plain enough for farmers to understand, and those of Sweden were not so obstinate as some in England: they cut the plant fresh who had it not in their grounds, and the consequence was the same in the cattle to which it was given. They then planted it where it did not grow naturally, and it appears, by all accounts, that they have found great advantage.

This is not all the benefit they have received from it: Sweden abounds with bogs, on which grow water-pennywort and other plants, which give that deplorable disorder, the rot, to sheep which feed upon them. It has been customary there as well as here, to remove such cattle into dry upland pastures; but this will not always succeed where there is no farther assistance: it appears by manifold testimony, that the sheep, turned into a ground where this plant is common, always are cured. These creatures are fondest of the young leaves, just as they shoot from the root: the larger cattle eat the stalks; but the finest part of all is the flowery top, just when beginning to bloom.

These are the advantages arising from this plant, in the limited use that has hitherto been made of it: but there is yet a great field open for improvement and more benefit. It is no small merit that it will grow and produce large crops where little is to be expected from any thing else; but probably it will succeed as well in tillage as in pasture ground, and may prove an excellent addition to the number of our artificial grasses: at least, the experiment is easily made, and there is great probability of success.

#### CHAP. LXV.

##### *Description of the plant.*

**L**ADIES mantle is a native of England as well as Sweden, and it thrives no where better than in our northern counties, where improvements are greatly wanting. It may be easily introduced thence into the other parts of the kingdom, where it is less common.

It is a perennial plant, very spreading in its growth, but of no tall stature, nor subject to run up into hard, useless stalks. The root is composed of many fibres; the leaves are large and beautiful; they grow singly on short thick foot stalks, not by threes as in the trefoil kinds; and they are very tender, and well tasted. When fully expanded, they are as broad as the palm of one's hand, almost round, but running out into several corners, and notched very delicately.

When these first rise from the root, they are folded together in a most elegant manner with long plaits and ridges, and lie in a small compass. They keep thus a considerable time before they expand; and it is in this contracted state they are most delicate and nourishing.

The stalks are numerous, so that the produce is very great; for they also are covered with leaves, and terminated by large flowery clusters. They are about fifteen inches in length: but they never rise perfectly upright, nor do they lie upon the ground; their natural posture is slanting upwards, and one plant in a good state will thus spread into a circle of nourishment, of half a yard in diameter. The leaves from the root will be very abundant, as well as the stalks, and with good management there will be a continual supply of food for a great number of cattle, from a moderate pasture.

The flowers are small, and inconsiderable singly, but they stand in such large clusters, that they appear very conspicuous. They are of a greenish yellow, and they are of considerable duration; for to speak properly, they are rather cups than flowers, and are not of the nature of those gaudy parts of plants which soon decay. The seed follows, and is in its nature nourishing, more so indeed than many other kinds; but there is no great quantity of it produced, and it exhausts the plant so that it never should be regarded, except when some of it is wanted for sowing. For this purpose a very little of it goes a great way; and it will be proper to leave a few plants annually to ripen some for this service.

It is an advantage in the growths of this plant, that beside bearing the bleak exposure of hills, it will grow very well where there is shade, and may therefore be usefully sown in those pasture grounds bordered by woods; and toward the hedges of others where there are many trees, for it will find its nourishment not only in spite of their shade, but even among their roots.

#### CHAP. LXVI.

##### *Of saving the seed.*

**T**HE seed of ladies mantle is not to be bought; for the seedsmen yet have no knowledge of the herb: therefore it must be saved from the wild plants. The curious, in some places, raise it in their gardens, but the seed of such plants is not what we recommend to the farmer; neither that of all the wild ones.

What I have observed of the growth of the plant is this, where it rises among thickets under hedges, or sheltered by trees. The leaves are more numerous, the stalks taller, and the whole plant greener; but in these places the seed does not ripen favourably. In open dry places, toward the tops of hills, in the midst of pastures, and where there is no shade or shelter, the leaves will be fewer, the plant smaller, and it will be throughout of a yellow green; but it is under this less robust appearance, that the seeds are ripened to the greatest perfection.

Let the farmer who intends to enrich his pastures with this plant, mark some such roots as these for seed. The plant flowers in June, and the seeds will be ripened six weeks after; they are green at first, but grow yellow as they ripen; and when they are yellow throughout, and hard, they are fit for service. Let the plants be taken up with care, and the seed thrashed out, and let it be spread upon a sheet in an airy place, where there comes no sun till perfectly cured; then let it be tied in a canvas bag, and hung up from the ceiling in an airy room, till it is wanted. This way it will be not only preserved from vermin, but it will be kept in a good condition for growing; the principle of life is not so strong in it as in many other seeds, therefore this caution is necessary.

Though there be more of the plant in the north of England than elsewhere, the seeds ripen best in the more southern counties. There is more of it in the bishoprick of Durham than elsewhere in England; but the most perfect seeds I have seen, were ripened in Hertfordshire. Near Watford there is a good deal of the plant scattered in different places, and also about Leicester; near Andover in Hampshire also, and in many other places: from some of these the seed should be obtained, and, as in all new trials there is more hazard as to the success than in others on plants more established, too much care cannot be taken in this first article.

#### CHAP. LXVII.

##### *Of sowing the seed.*

**T**HE seeds of ladies mantle, when cured in the manner here directed, may be sown either in autumn or spring, but the former is most natural, for it is so the plant is raised by nature, and there is great advantage in its having the winter for the new shoots strengthening itself in the ground.

Nature makes no other provision for the increase of the plant by seed, but scattering it by the winds among the grass of pastures; but I have found this a too precarious method to be followed by art. In the experiments I have made, few plants thus rose from a great deal of good seed. I should therefore advise opening the ground a little for it; or else sprinkling it on largely just before the laying on of manure.

As in all new things, trials should be made at the least expence that can be, and this plant is yet altogether new to the English husbandman, the following method may be advisable.

Let a piece of pasture ground be chosen that is of as little value as may be, and let it be of such a kind as the plant naturally loves. If the farmer have a small close upon a hilly situation that is barren, over-run with bushes and ant-hills, and bordered by a wood, let him chuse this for the purpose; or let the land-owner inclose such a piece as this, so the soil be not absolute heath. The value of such a piece of land is very little, and whether the plant should succeed on it or not, the culture, we are about to direct, will not be thrown away.

In autumn let the dressing of the close be begun. Let the bushes be drawn up by the roots, with the instrument we have described for that purpose in the preceding volumes, and let it be used all round the hedges. In neglected ground the hedges always encroach upon the pasture; the bramble drops its ends and takes root, and the black thorn produces suckers to a great distance; let all these be cleared away in the same manner as those in the middle of the ground, and the pasture be thus restored to its original extent.

Next let thistles, fern, or other perennial weeds, be cleared



cleared away in the same manner; and lastly, let all the ant-hills be cut down by means of the ant-hill plow.

Let the person, who performs this work, carry some of the seed of the ladies mantle in his apron. The tearing up the shrubs and perennial large rooted weeds, will break the ground a little; and in every spot where it is so broken, let him bury half a dozen seeds at small distances; and at about a finger's breadth deep.

The surface will be left bare, where the ant-hills were cut up; and let him there stir it a little with a small rake, and scattering on some more seeds, tread them in, and rake the spot again. Lastly, let him go round near all the hedges, and especially toward the edge of the wood, if there be one; and moving the surface a little with a trowel at different places, let him put into each some of the seeds. Let these be let in close under the hedges, and on the sides and edges of the banks of ditches by them. Weeds will grow there if not prevented; and there is no way so well as this, of raising a useful plant in their place. It will soon be strong enough to destroy them. If there be a pond or hole of water, let the sides and sloping bank of that be also planted with some of the seeds; for this is an herb which will grow on almost all kinds of waste ground. This done, let the remainder of the seed be scattered over the pasture, where there has been no opening made, and thus all left to nature.

The single care requisite farther is, that cattle be not turned in during the winter, for the feet of cows and oxen would tread down and destroy the young shoots; and sheep are so fond of the first leaves, while just shooting, that they would gnaw them up roots and all. After this winter, the plants will be so well established, as to need nothing of that care.

If that be true in larger works which I have seen in small experiments, there will be a great many plants in the places where the ant-hills stood, and upon the banks, by the hedges, and in the places of the shrubs and weeds; but few in that part, where the natural grass was undisturbed. If this prove the case, some of the plants from the ant-hill spots where they grow thickest, should be removed into places where they are wanted. Half a day's labour will do this in a small close, and if a rainy day in spring be chosen for the purpose, scarce one plant will fail growing.

As a great point will now be establishing the roots, cattle should not be turned in in wet weather. In June the plants will be got into flower, and the ground should then be mowed. The hay, though small in quantity, will be excellent in its kind; and after this the roots will not make any other vigorous push for flowering: they will be unexhausted, and their produce in leaves and shoots of stalks, which may be eaten off while young, will be very great.

Thus is the pasture prepared at small expence: and it becomes not only a valuable one for general feeding, but a relief of a very extraordinary kind for cattle, that have been rendered sick by the rank weeds of marshy grounds, and for cows, whose milk is either rendered bad by improper food, or grows deficient in quantity. We know the stomach must be in order, or it is impossible good milk can be produced; and there is a peculiar virtue in this plant, for disorders of the stomach in these cattle. When they yield little milk, the quantity is found gradually to encrease, upon their taking this food; and when the bad quality is more the case, the quantity will seem lessened at first, but it will immediately grow better in quality; and from time to time the quantity will afterwards encrease, till there will be at least as much of the good milk, as there was of the bad: and the amendment will continue.

This is of great consequence to the farmer, who uses his milk in his own dairy. When it is for sale, the quantity is more regarded than any thing; but it is otherwise when the butter is to be made at home. Farmers at all times have known, that the food of the cow had great effect on this; but they have not always guessed at the true cause. They have thrown the praise sometimes on one plant, sometimes on another; but there is none equal to this, nor can any thing be easier than raising it in due quantity. Whether it would serve alone, is a point yet to be determined. What we know of its effects, is in a mixture with grass; but it may be raised singly in fields, and the experiment is very well worth trial.

C H A P. LXVIII.

*Of the management of the pasture of this plant.*

AFTER the first year's growth, nothing can hurt the ladies mantle: but there are many things that may assist its growth: and this is an article worth attention. The dung of cows, though cold in its nature, agrees very well

with this plant; but of all things which promote its free growth, that mould which is dug from under the bottom of an old wood pile is the principal. This we have advised the farmer to use on his pasture ground in general, for it favours growth of all pasture plants, and in particular of grass and trefoil; but there is a peculiar reason why it is excellent in this respect for the ladies mantle, which is, that one of the natural places of growth of that herb, is in coppices and low woods, where the broken branches rot upon the ground, and afford a peculiar kind of natural manure, which favours certain plants. Wood betony and sanicle are of this number; and ladies mantle, though not limited to wood ground only, never flourishes better than when it has chanced to sow itself by one of the road ways, in such a wood; where there is air, and this particular nourishment.

For these reasons let the farmer procure a quantity of this manure; and in autumn, when the cattle are taken off to give the pasture time for a new shoot, let a small quantity of this be strewed over the places where the ladies mantle grows. It will not be wanted under the wood side, or close to the hedges; for there nature supplies the same assistance: but in the open parts of the ground, where the ant-hills have been cut up, let this be done, and it will be worth while for the first time, and while the plants are young, to lay it on tenderly by hand, that the heart of the plants be not covered. A few showers will wash in its virtue, and by that time the natural grass has recovered itself, this will be in good condition again.

Ladies mantle is green all winter, and naturally sends up fresh supplies of leaves as the old are eaten; but it will do this more fully, after the manure we have directed; and the pasture will recruit itself after feeding in a surprising manner, not only for quickness, but for quantity.

In feeding countries it will be advisable, if the method proves as successful in England as in Sweden, to have a certain number of these pastures to be eaten in succession; that when the cattle are turned out of one into another, there may be time for a new shoot of this quick growing plant, without any necessity of eating it down too low.

How far it will succeed as hay, is another article not yet determined by experience, but there is all the probability in the world that it will answer excellently in this case: there should be only one crop cut in the season; all the rest fed down. The summer crop for hay must be cut just when the plants are at their full growth, they and the grass together; and after this, the plants will be easily kept to leaves only; for the shoot for a stalk and for flowering, is naturally made only once in the year, and that is the only time when it is pushed forcibly: for the rest, if the young stalks be eaten down once or twice, just when they would make the second and third attempt, all after this will be spent in leaves, of which there will rise clusters after the third or fourth year, as much as a bushel would cover from every root.

The farmer who shall be induced to try this plant, should watch, by the condition of his stock that feed upon the pastures where it is raised, what proportion of the ladies mantle does best among the grass: for I am inclined to believe, from all I have read or seen, that this plant succeeds better, at least for milch cows, when it is eaten in a certain proportion with grass, than absolutely alone.

Experience and observation will be the best guides in this matter; and when this just proportion is once known, the plant will be easily kept up to it; for when there is once a quantity of it established, there will always be new plants rising in the field, which may be pulled up or spared according to that direction.

C H A P. LXIX.

*Of the care and management in succeeding years.*

LADIES mantle increasing very fast at the root, the several tufts will in time exceed the bigness we have mentioned; and when they are too much enlarged, the outside only will be good, the middle of the tuft producing less; and what it does, inferior in its nature.

The same thing occurs in gardens; where the perennial rooted plants would soon be choked up with their own abundance, and lose a great part of their beauty, did not the gardener take them up and part them. This would be too much trouble in a field; and it is not necessary: there is another way more easy, and more beneficial.

It will not be till the sixth or seventh year that the plants will any where be encreased to this improper size; and it will be then principally on the places where the ant-hills stood, because there each tuft is composed of several others.

In the autumn of that year, let these large tufts be pulled up entirely; a proper reserve of others having been made, to supply the place of them; and let the new broken

mould



mould upon those spots be sown with hay-seed of a proper kind: best of all, if from the hay of the same or some like pasture. The baldness of these spots will last but a little while, and the grass that grows from the seed sown upon them, will presently overtake the rest. The upper coat of the mould, which is the principal part into which the roots of grass run, has been in a kind of fallow under the shade of the stalks of the plants which grew there, whose roots went deeper for their nourishment, and the new growth upon them will be very vigorous for that reason.

One article there is we have not yet named in the economy of this plant, which is, the saving seed from the pastures thus enriched with it; but a very short instruction will serve that purpose. How nature forms the most perfect seeds of it, we have shewn; and in the parts of such a pasture most suited to that purpose, that is, in those parts which are most open to the sun, a certain quantity of the plants should be reserved for that use. This must be done by fencing them in with hurdles from the beginning of May, till the time when the seed is perfectly ripe: they are then to be cut as we directed under the first head, and that part of the pasture will be soon in the same condition with the rest. To promote this, it may be proper, as these particular roots have been most exhausted, to sprinkle over them, when the plants are taken off, some of the wood-pile earth before directed.

Horse dung is the common manure of pasture ground in the neighbourhood of great towns, where it can be had in sufficient quantity; but it should not be used to these pastures where so much dependance is had upon this particular plant; for it is against its nature. Nothing is so well suited to it, as the dung of large cattle. That of sheep would be too hot alone; but when these, and cows or oxen are fed upon it alternately, the coldness of one of these dungs moderates the heat of the other, and the whole very well answers the purpose.

These are the best directions which we are yet able to give; but they are very imperfect in respect of what may be done hereafter, if the plant should get footing in England. However, such as they are they cannot mislead: they are founded upon the nature of the plant, and what is known of its culture in Sweden; and they are sufficient till more of it is known.

#### CHAP. LXX.

##### *Of the bur-reed.*

WE last treated of the culture of a plant, suited by nature to give additional richness to high grounds; but these are not the only kinds of land capable of improvement by the introduction of herbs suited to them; and fit for the purposes of feeding. The lowest, wettest, and most marshy ground, is capable of a very easy amendment upon the same principle; and the plant we are about to recommend for that purpose is a very common one, though neglected. Observation has shewn in other countries, that it is useful in this respect, and those, who have seen this, have propagated it in such places. The advantage is not so great as in the preceding instance, but neither is the trouble; and as that was employed on land of little value, this is intended for such as is of no value at all.

When we name wet and marshy places for the raising of this plant, we are not to be understood as meaning bogs. There are plants peculiar to bogs, utterly distinct from the common water plants, and unlike them; as the wet in which they grow is unlike common water. By water plants we understand those which grow about the edges of rivers and ponds: and bur-reed is one of these. It will readily grow on such wet soils in other places; but not on bogs: for though it requires a great deal of water, it must be in the natural state; not such as is seen in the wet parts of absolute boggy land.

The plant has been known in the earliest time; and from thence to the present it has been known cattle eat it greedily, but no advantage has been made of the observation. Theophrastus, who calls it *Butamus*, a name we have of late attributed to another of the water plants; says, oxen fed on it; and in the Isle of Ely, where it is most common of all, though every where frequent enough, the farmers observe, that their cows and oxen frequently get into muddy ditches, where they are in danger of being lost for the sake of feeding on this plant which grows in them. They have, in some places, been at the pains to destroy whole banks of it, by tearing them up and burning them, not recollecting that the fondness of these cattle for the herb, and their plainly feeding on it without hurt, was an indication that it would be worth their cultivating in places where it could be got at without this danger; and

where the ground was good for nothing else. Linnæus, in his account of the Lapland plants, makes the like observation on the delight oxen take in feeding on this; and others, in various places, have made the same remark. What I have endeavoured to find farther is, the effect it takes upon them. This I have enquired by letters, to various persons who are curious in these researches; and though a full credit could not be given in such a case to any one testimony, because error is so easy, yet, when several confirm a fact, we may reasonably suppose it true; at least, if the accounts are favourable, we are justified in recommending the thing to more trial.

All the information I have received concerning this plant, declares it to be innocent, and some go much farther, declaring it highly useful.

Upon a fair observation made for many months, on cattle put to feed in pastures where there was, and others where there was not this plant, it appears that those fattened sooner where there was plenty of it, than such as fed on pastures where there was little or none. On examining the dung, which I desired might be particularly observed, suspecting the plant might incline them to a purging; nothing of this appeared in any instance wherein I have received information.

The effect on milch cows is the increasing the quantity of their milk; whether or not it debased it in quality, I am not able exactly to determine. If it have that effect, it cannot be in any great degree. The generality of those, from whom I receive accounts, mention the increase of quantity without any hint of the quality being altered; but from two correspondents in different parts of Yorkshire, I received suspicions, that the advantage in quantity was lost in the different nature of the milk. These correspondents say, that it gives no peculiar flavour to the milk, but that it is thinner, and somewhat bluer in colour; and that the cream, though good, was not in the same proportion.

Thus stands the present testimony, which future observations will either confirm or refute; but as it stands, there is all imaginable reason for making the experiment, and there will be no expence, nor can any thing be more easy.

#### CHAP. LXXI.

##### *Description of the plant.*

THE bur reed is a plant of two foot and a half high when in flower, but the far greater part of the year the leaves only are seen, and these are the best nourishment. The root is composed of many long strings joined to a small head. The leaves rise in clusters from these, and they are long and fleshy; they resemble flag leaves at first sight, but when better examined, they are found to be not flat, but almost triangular. They are of a fine, fresh green colour, and very juicy.

The stalk is round and thick, sometimes it rises single, and sometimes it is branched: there are leaves on it, principally toward the bottom, and they are like those from the root. The flowers stand in round knots toward the top, and they are small and white, the seeds follow on lower parts of the stalk, and are collected also into round clusters, like burrs upon the common burdock, or like the fruit of the plane tree. These ripen and may be sown: but the ready way of propagating the plant is by the root. Wherever there is damp ground it will grow; but the great advantage of it will be to the farmer, who has a brook running through his grounds; or any other quantity of water.

The sides of rivers are always covered with a kind of water weeds, and these are generally useless, and many kinds of them dangerous; for the most poisonous of the English plants are natives of our river sides. In the place of these he will have an opportunity, with very little trouble and without expence, to plant an herb that will be, in the highest degree, agreeable to his cattle, and will answer his purpose excellently in feeding them; and perhaps, yet more beneficially serve him in regard to his cows, by increasing their quantity of milk.

There will be this farther advantage in raising the plant, that it will keep the shore clear of several kinds which are apt to encroach upon the land. The water weeds of some species are of the same quality with the hedge shrubs of pastures, they will run at the root, and encroach upon the banks. Thus the water docks and many other kinds which no creature eats, when they have got footing upon the bank, run into the ground, and the farmer loses so much land for all useful purposes, the whole way. This may be prevented by planting this particular herb; for it will occupy the place entirely, giving no room for any other; and it will not run into the ground, unless, where that happens to be so watery, that it will bear nothing else: in which case, the roots



roots will extend themselves to the great advantage of the farmer, and not at all in any other.

The husbandman who has pasture ground, through which a small river runs, or who has observed the same kind of land in another's possession, if he have looked with a careful eye, must have seen, that what may be called the bank loses something; and that the weeds from it propagate themselves into the water, so as to make it a much more considerable extent. I have seen, where a brook has been but five yards wide, a yard and half of the surface of the water on each side covered with weeds, which had rooted themselves in the land, and sent off runners in the place of roots, which floating on the water, get abundant nourishment, and make an absolute and continued coat over the surface. Since this is the course of nature, and she will have it so, the question is easily answered, whether these weeds shall be poisonous, useless, or wholesome. This is in the farmer's power, and let him use that opportunity rightly. All water plants are full of life, and none more than this: therefore, wherever it is planted in the neighbourhood of water, it will grow.

#### C H A P. LXXII.

##### *Of the manner of planting it.*

AS I conceive the farmer will reap great advantage from this herb, and the utmost trouble he can employ upon it is but little, I would not have him omit that. The following method will be the best for planting it. Let him clear away all the weeds which grow along the banks of the brook or river, and all that run into the water itself from the sides. Let him distinguish those which run in from the sides, from such as absolutely rise from the natural bottom. There are many of these, the pond weeds and the like, and it is unneedful to displace them, because nothing will grow in their place; but what we mean here, are those kinds, which, though their roots are in the mud, are, in every other part, out of the water; and which have originally been sent into the water, by creeping roots and stalks from the bank. The same mud which supported these will as well nourish the useful herb here proposed, and being cleared of these, it will readily receive it. Let the face of the bank be also cleared, for it must be planted there; and let not the farmer grudge this trouble, for he will have no more. Indeed, if he be a good manager, this labour will pay itself, independently of the expected benefit. The weeds are not to be thrown away; they will make a very useful addition to the dunghill.

When the bank is cleared, let a parcel of the bur-reed be drawn up from some neighbouring water in the month of August, and then let the farmer part the roots, trim off the fibres as gardeners do, and opening holes in the bank on each side at a yard distance, and just upon the level of the water: let one good root be planted in each of these holes: nature will do all the rest. The plants will be strong before winter; and the next spring the whole verge of the water on each side will be covered with a green bed of this herb.

In July they will shoot up for flowering, but this should, by all means, be prevented, for it exhausts the roots, and prevents the growth of leaves. No more is required than to send a man with a scythe along the banks, or into the water, with orders to cut off all the rising stalks.

Once again, at the distance of about three weeks, it will be proper to do this, but it will not be necessary after that any more; for the shooting season will be over for flowers, and the whole force of nature will be spent in forming off-sets from the roots, and sending up shoots of clusters of leaves from them.

What may be done thus, by a very little art, I have seen plainly enough proved by what happens in nature. Near Denham in Buckinghamshire, there is about a quarter of a mile of one of the banks of one of the shallow trout rivers, occupied by this valuable plant. It has, every where, run three, four, or five feet into the water; and wherever there is a hole burrowed into the land by any sudden turn of the stream, this also is covered with it. Where any little ditch or drain opens into the river, the water just has its current, and all the rest of the space is occupied by bur reed. The quantity is vast: it has no where encroached upon any useful part of the ground; but compleatly occupies, all that is too wet, for better produce, taking the place of rushes and those other four weeds, too common about waters. The cattle are extremely fond of it; and the more it is crop'd, the faster it grows. I have enquired among those, to whom the cattle belonged, which fed on this particular spot, what were the effects: but these kind of people less attend to their own business than any others.

All I learned was, that these pastures were esteemed better than the others about them; but as to the plant, which was palpably the occasion of that superiority, they plainly knew nothing of it: not so much as that any such thing was there.

Where the water is of this kind, clear and swift in current, and the adjoining ground rich, this plant flourishes best of all. These waters are generally shallow; and the cattle walk in up to the mid leg, and stand in them feeding: an epicure would envy them the repast. His wine in ice does not equal the coolness of the fresh stream, nor all his delicacies the full flavour of that single herb to their undebauched appetites. This may be seen in their aspect, and the consequence is their growing fleshy: and for the same cause, better health and more nourishment, the cows also fill the dairy.

In some other pieces of ground near the edges of the same rivers, I have observed this plant grow all along the sides of the little drains they cut to let off the water after flooding; and the consequence has been the same as in the other instances: the large cattle, fed upon such ground, have always eat this down before they touched any thing else upon the place; and they thrive very well so long as there was any quantity of it, and no longer; for the general growth upon ground, that wants this kind of draining, is not favourable to these large and nice creatures.

From this observation, which, however limited in its nature, is accurately true, we may be led to something more of extremum use in many parts of the kingdom.

#### C H A P. LXXIII.

##### *Of planting bur reed on boggy ground.*

I Have observed that the bur reed is no where more plentiful than in the Isle of Ely, and the other fen countries. It may be there made of great use, though at present it is not; and by the same rule in other places, which are of a like character and quality. We have large spots of ground in many parts of the kingdom, which are called moors; and which are of the nature of the fen land: that is, they lie just above the level of the rivers, which run by them in their common state, but considerably lower than the waters rise in floods. They are therefore often overflowed, and always wet; they are of little value for any of the farmers purposes; for the grass is poor and sour, and it is only a part of the year they can be of any use, or are passable.

There always are hollows and a kind of ditches in various parts of these grounds, which detain the water longest, and which indeed are scarce ever truly dry. These are, in some degree, of the nature of those artificial drains before mentioned, only much more extensive. The soil is a loose, rich, black earth, such as the bur reed loves; and there is generally moisture enough for its favourable growth.

The ditch sides, in these kind of grounds, usually abound with the bur reed, but there it is dangerous for the cattle to meddle with it; for these ditches, which serve in the place of hedges in those countries, separating and enclosing the several portions of land, are dug deep, and have muddy bottoms; so that an ox is in danger of being lost, if he happens to fall into one of them. It would be advisable therefore to drag up this herb from the sides of those waters, and plant the roots in those low places of the ground itself, which have been just mentioned. Here it will soon take root, and cover the spot with a most useful growth. The method of planting should be the same as directed for the banks of brooks, and nothing will grow more readily. The plants should be set in August or September, and about two foot and half distance, every way will answer very well. These will join one another in a very little time, and there will be one continued bed of this useful herb.

This will be the more advantageous in such places, because the grass is in very small quantity; and though it fade a little in long droughts, it will recover after the first rains; and every overflowing of the ground will be as a kind of proper culture given it purposely.

The vast quantity of ground that lies waste in England, is one of the great reproaches of our government, and the loss to the state is vast from this single article. This waste land is of two general kinds, heath and bog. For the improvement of the first species we have given many rules, and there has been of late so much done in the reducing such ground to a state of culture, that the kingdom seems in a great way of increase from it.

The other, or boggy land, is of a different quality, and requires a management altogether different. The draining it is the first natural attempt; and the most rational; but this



this is best suited to such places as have very great quantities of it. There are spots too small for such undertakings; and peculiar places among better land, which neither will admit that improvement, nor are worth the trouble of it. The proper management of these is, by finding useful plants that will grow upon them; and, in many cases, when the ground, though of a larger extent, will not admit of draining, the same course may be useful. The improvements upon this head depend on one principle, and that an extremely plain one: he will succeed best who knows what is the most useful plant that every kind of ground is able to support; and this is what I have laboured to inculcate here.

## C H A P. LXXIV.

*Of buck bean.*

WE shall pursue the subject of the preceding chapters, the planting of wet ground, through the present, and the two or three succeeding; and we have a plant to recommend, of which the farmer probably has not heard before, or if at all, very imperfectly. Its use is less known than its form, but it is such as is very worthy attention.

Every one knows the value and the expence of hops; and these, who have at all attended to the expence of raising them, the labour of gathering and curing, and the many accidents to which they are liable, will not wonder at the large price for which they sell at market. It appears, from the most certain of all proofs, experience, that the leaves of this plant buck bean, are of the same quality: they may be raised with very little trouble, on ground which is of as little value; and the quantity they produce is very great.

Many attempts have been made to save the hop, but all, except this, unsuccessfully. Wormwood has been used, but this is extremely nauseous: we want a bitter, but it must be a clean and pleasant bitter. Wormwood, on the contrary, has, beside its bitterness, an insupportable nauseous flavour. The leaves of buck bean are as bitter as the hop; and if they want the peculiar flavour of that fruit, they have nothing disgusting in the place of it. They have bitterness to recommend them, and nothing more: nor have they any thing against them. As to their qualities they are very wholesome, and if beer can be made pleasant to the palate, and capable of keeping with them as with the hop, they will be a great advantage to the farmer, who has ground fit for them, and which lies at present useless.

Whether the leaves of this plant are capable of answering the purpose of hops fully and perfectly, I cannot say with certainty; because the experiments I have known have been made with the herb, either fresh, which is very wrong, or ill cured, which is little better: but in these they have succeeded so well, as to make it very rational to believe, that under proper management, they may answer perfectly. I have tasted beer brewed with them by the poor, which has been at least as good as any which these people ever made with hops; and I have occasionally drank some of a better kind, brewed with the same ingredient, by those who did it for the virtues of the plant: and this has been much superior to the first; but not equal to the brewings of the same family with hops.

It is plain, from these examples, that the leaves of this herb may imperfectly serve in the place of hops; and this would be something, would the matter go no farther; for they might save the expence of that article in the farmer's brewings for his own family. But it yet remains to try what would be the absolute effect, if these leaves, which, in all those cases, have been gathered with little skill, and used with less, had the fair trial of a proper gathering and good curing. From what is seen, the farmer may be certain it will be worth his while to propagate the plant upon such ground: and we shall direct him in the management of the leaves, in such a manner, as may perhaps set them in a much higher light.

## C H A P. LXXV.

*Description of the plant.*

THE root of buckbean is very large, irregular in shape, and spongy in its substance; it is long, and considerably thick, and it does not pierce down perpendicularly into the earth, but runs slanting under the surface, sending up shoots of leaves from various parts, and by that means spreading and multiplying itself greatly.

The leaves are placed there on each foot-stalk, as in clover, and the other trefails, but they are vastly larger than in those plants, they are of an oval form, and of the bigness of a bay leaf: many of the stalks rise together, so that the

quantity of leaves, upon a single plant, is often very considerable.

The stalk for flowering is about ten inches high; and the flowers, when they are suffered to ripen, are very pretty. They are moderately large, their colour is white with a blush of red, and they are hairy: the seed vessels which follow are oval, and contain many seeds.

The leaves are the useful part, therefore they should, by all means, be encouraged, and consequently the flowering stalks should be cut off before they open into bloom. This is easily done, for the flowering season comes on regularly toward the end of July; and if they be cut off at that time, they will not shoot again for flower that year. A man with a scythe will be able to cut them down in a few hours throughout a whole field of the plant. There is not the least occasion for sparing any part of the flower, for the seeds are never wanted, the root multiplies so abundantly.

The plant is common in wet ground in most parts of the kingdom; and may be propagated successfully any where, where there is moisture. We observed, in speaking of bur-reed, that it would only grow where the water is clear and good; but this plant is less nice in its nourishment. I have seen it in the fens about the peat-ground; and have observed it flourish very well in places so nearly of the nature of bogs, that it is probable it may be raised in absolute bogs, which cannot conveniently be improved by draining.

## C H A P. LXXVI.

*The manner of planting it.*

LET the farmer chuse a piece of ground that is wet in itself, or subject to be so often overflowed, that it produces only rushes, rush-grass, or such other useless matters; and let him dig away any great clumps of rush or flag that happen to grow in it: as to the rest of the produce he may leave it. The buckbean flourishes best, when its root runs under a covered surface.

To plant this regularly, let a line be drawn as gardeners use, first two foot from the edge that is toward the water, and let small sticks be set up at eighteen inches distance, all along this line, as marks where the plants are to be let in; then let the line be removed, and stretched again parallel to the first, at two foot distance, and let another row of sticks be stuck into the ground a foot and half asunder, but not opposite to the other, but to the middle of the spaces between them. In this manner let lines be drawn over the whole ground, and sticks stuck in to mark the places of all the plants.

In the beginning of September, let a parcel of the plant be taken up, sufficient for the new ground, and the roots regularly let in.

Every root must have a good head or eye, and should be of about two inches length. The best instrument for planting is a sharp trowel: with this let the turf be cut through in form of a cross where the plant is to stand, and then lifted up. Let the fibres of the roots be trimmed off, and let it be planted with the eye upwards, an inch or thereabout beneath the surface, and the turf let down upon it.

This is very quickly done, and no more is necessary; the ground is naturally moist, and a wet season will follow. The roots will succeed so well, that a first gathering of the leaves may be made early in the following summer; and from that time the plants will increase, till the whole ground is covered with them.

If there be any large weeds among them, the first year they should be pulled up. Water docks and the marsh thistle are most likely to be troublesome; and these should be destroyed in May, before they have time to seed, because they then lay the foundation for a lasting progeny. After this, the plants will soon occupy the ground so thoroughly, that no weeds can find place among them. The flowering stems, we have observed, must be cut off, when they first appear, and by this means the quantity of leaf will be greatly increased.

The farmer, who sees a piece of ground thus covered with the plant, will perceive that one crop of the leaves must amount to a considerable quantity; but he will have many such in a year. How many exactly it is not possible to say; but by what I have seen in my own trials, I believe he may reasonably expect six.

By the side of the DENHAM river, about a quarter of a mile above the place where it runs into the gardens of the late SIR ROGER HILL, there is a long close surrounded with water, and from its low situation always wet. It is also subject to very frequent overflowings, for being naturally but a few inches above the level of the water, whenever the mill that is upon the river in those gardens is shut, the water



water rising above its level, floats it entirely. In this close there is a vast quantity of buckbean; and I made last year several experiments upon one particular spot of it.

The principal were with regard to the root, which I find will grow from very small pieces; and to the quantities the plant may be brought to produce.

I took off the leaves from all the plants in a certain spot of this ground, as soon as they were of their full growth, and taking the caution to cut off the flowering stems when they appeared; and to gather every parcel of leaves as soon as they were full grown, I took from the same plants seven quantities of them. It is upon this account I have ventured to guess at the number of crops. The plant grows in that place among other weeds, as they are called, and with little care or regularity; and probably under a better management, more might be obtained from it; but this is no trifling account, especially as the leaves are large.

#### CHAP. LXXVII.

##### *Of curing the leaves.*

**T**HE taste of the leaves of these several gatherings was equal, except that in one crop I had left them too long upon the plant, they had grown brown on the edges, and were less fresh than the others; and they had less bitterness.

This may serve as a caution not to neglect the time of cutting them, when they shall be raised for use; for their period of perfection plainly is, as soon as they are fully open; and after that they lose rather than gain any thing for some days; and when they begin to lose their fresh green colour, they grow worse.

The leaves I gathered were dried afterwards upon a line stretched across a barn: but this is not to be practised for quantities. Bitter is a quality that is not to be lost in any common management, for it will not rise in distillation, nor be obtained any way by evaporation; therefore neither can it be lost by evaporation: so the farmer need not fear this accident. The leaves should be cut with a common scythe, and then carried off the ground to be made as hay. They will require no more care or management than common grass, only the ground whereon they grow being damp, they will not dry upon it, nor can the people tread about, in making it, conveniently to themselves, or without doing a great deal of damage. This cutting takes off also the shoots of stalks, intended for flowering, and unless the gathering happen at odd times, there will be no need of any farther care on that head. If those stalks should be getting to a height, while the leaves are but growing ready, the tops must be taken off by a few strokes of the scythe, as we have directed.

The leaves being carried to a dry piece of ground, are to be spread and turned often; for the quicker they dry, the greener they will be; and the finer is their colour, the better always is their taste. When they are thoroughly dry, they should be picked off the stalks, for it is the leaves themselves that possess the virtue fully: the stalk is spongy, waterish, and has much less of the bitter: it approaches toward the nature of the root, which is so far from bitterness, that it is like flour or meal when dried and ground to powder; inasmuch that Linnæus tells us, the people of the northern provinces have, in scarcities of corn, used it instead of flour for bread.

The leaves are to be the English farmer's consideration, and they should be separated from the stalks, as soon as they are thoroughly dry, not only because the stalk has no value, but because they will be easier to pack up without it; and its spongy substance being apt to attract moisture, the leaves will be in danger of getting damp, and of decaying if it be left on. As to the addition it would make to the quantity, that is no consideration at all; for it would reduce the value in proportion: so that on all accounts the method of picking off the leaves will be best. Women or children may do this, and the charge will be very little. After the leaves are thus separated from the stalks, they should lie one day more to air again; and they may, after this, be packed up in parcels, and put in barrels, treading them down, or any other way kept close, and fit for use or sale. They will keep good three or four years; or if no accident happen to them through damps or otherwise, longer. But they are best the first year.

#### CHAP. LXXVIII.

##### *Of the management of the ground.*

**T**HE quantity of moisture that agrees with this plant is very considerable; but it may happen that there may be too much. Though the ground should be moist, it

should not be overflowed; therefore drains must be made with a sluice at the bottom, which will enable the farmer to keep in as much water as will be useful, and yet to prevent what would be destructive. The drains need be little more than those single spade deep trenches they cut, for getting the water out of meadows; and the plainest and simplest sluice that can be made will answer the purpose.

With these easy cautions the ground will keep in very good order, six years or thereabouts; but after this, the roots will be matted together, and choking one another, the produce will be less. They will require parting according to the gardeners fashion; and once again the labour of the planting the field must be repeated. This will be as cheap and easy as the first, and will give it as good a condition for six more years.

The best season for taking up the roots is September; and it need not be done with any great care: the only fault in the field is, that they are too abundant. They must be taken out; and cut into smaller pieces, and these planted again as at first. The rest, if not wanted for a new plantation, should be added to the dunghill; for it is a root that easily rots, and makes a very good addition to manures; and there is no danger of its growing on the lands where this dung is to be used; not only because it will so soon rot in the mixture, but its natural place of growth being by waters, if by any chance a piece should keep the remains of life, it cannot grow for want of that essential article in its production.

That the leaves will answer the purpose of hops is certain; and I think that when cured in this careful manner, and used by an experienced brewer, they would at least equal the hop; and perhaps might prevent some of those many accidents which happen to beer in the keeping, and which, tho' they are attributed to very different causes, are many of them owing really to that ingredient. With regard to its medicinal virtues, they are those of all bitters, strengthening the stomach, and assisting digestion. It is also in some degree diuretick, clearing the urinary passages, when taken alone, in a strong infusion. All this must help to recommend it the more, for it will render the malt liquor, in which it is used, also in some degree stomachick and diuretick, and will be a great preventer of the gravel and stone. It may not be foreign to the intent of this work, to add on the present occasion, that malt liquor is the only rational drink of people subject to those terrible disorders. This was proved by a very surprizing instance in the observations of Dr. Cyprinus; who, of many hundred he cut for the stone, declares, there was not one absolute beer drinker among them.

#### CHAP. LXXIX.

##### *Of the buckthorn shrub.*

**F**ROM the plantation of meadow ground, we advance to that of hedges, in which there is one shrub that occasionally shewing itself, convinces the farmer it will grow very well, and very freely in them; and which though neglected hitherto, will, if we can bring it into use, be a very great addition to his gains. This is the common BUCKTHORN; a strong, hardy, prickly shrub; native of England, and ready to grow wherever the common hawthorn will.

In the common advantages of a hedge, it is second to none except the hawthorn, which indeed exceeds all in that single use, and would be preferable to all others, if no good could be expected from a hedge but as a fence. But there may be a great deal more benefit from hedges not only expected, but easily obtained. In firmness of wood, this is equal to the hawthorn, and the thorns are as formidable; they do not rise as in the bramble, from the bark only, but as those of the hawthorn, from the wood. The shrub itself is of a taller growth than even the hawthorn; and if pleasing the eye be an article of any consequence, its leaves are of a handsomer shape, and brighter colour. The circumstance in which it is inferior to the hawthorn, is, that the branches are not so numerous; so that it naturally does not form so thick a hedge. Far be it from us to lead the farmer into errors: he must not depend upon it alone; but if he will raise a hedge with alternate plants of the common hawthorn and the buckthorn, it will answer all his purposes as a fence, as well as if it were of the hawthorn alone; and there will be a very great advantage in the shrub we recommend beside.

If it were only for the use apothecaries make of the berries, the advantage would be something; for syrup of buckthorn is a medicine in very general use: but beside this, the colour called by painters sap green, is made from them; and on both these accounts they bring a considerable price: but the article for which we particularly recommend the shrub, is of another kind. The bark is a



very strong and lasting yellow colour for dying. This is not only useful simply in itself, but in the management of other colours, and may be an article worthy, in a particular manner, of the attention of that excellent society now established for the improvement of arts and commerce. It is the province of the naturalist to examine what may be useful; and of the farmer, to make the trial; but it is theirs to honour and reward those who shall succeed. Genius is usually poor, and many valuable improvements die in the hands of their inventors, or enrich other countries which pay their writings that attention their own deny.

In a period when the spirit of enquiry is at its height, and the general neglect of what is useful is in no lower a condition, such a society seems to have been inspired by that providence which has the care of states, and which, for the merit of a few, perhaps regards this.

That an useful addition may be made to the articles employed in dying, by introducing the buckthorn, is not only reasonable to think, from what we see, in chewing the bark of that shrub, or in the other easy ways of trial, which fall within the reach of private hands; but from the experience of other kingdoms. It has always been used in some parts of Germany, among other ingredients for that purpose; and Linnæus, in his journey into the northern provinces of Sweden, found it in common use there for the purpose of dying.

The colour that it gives is a strong and bright yellow; and there is with it a glow of purple, which may be increased or diminished, according to the management of the bark, and to the other ingredients which may be added to it. There is something singular in the colour, which it yields most freely; and it is as beautiful as it is peculiar: one would not imagine that it was the effect of any one ingredient. That the farmer may not fear having some advantage from planting this shrub in his hedges, we have named before the price its berries will obtain; and have directed the planting it in such a manner, that his hedge will be as good a fence, as if it were of hawthorn entire: and for his farther encouragement with regard to the colour that may be made from the bark, I shall add this proof, that a colour for painting may be made of it. I have extracted such a one from this bark; and I do not yet know, that any vegetable substance will yield this body of colour, which does not also afford, with a much easier management, a liquor for the service of the dyer.

#### CHAP. LXXX.

##### *A colour prepared from this bark.*

IN June 1756, I pulled from the wood a quantity of fresh and fine buckthorn bark, from the middles of the branches; its weight was some ounces above three pounds. I cut it to pieces, bruised it in a marble mortar, and worked in with it, by degrees, two quarts and a pint of common water, beating and grinding the bark fresh with every addition of the water, till the whole was very strong with it. I set this by six hours, then poured to it an ounce of oil of tartar per deliquium, and putting the whole into a large earthen pipkin, I set it over a gentle fire to heat, and after an hour and half let it boil; stirring it from time to time with an ivory knife.

When it had boiled gently a quarter of an hour, I pressed the liquor gently from the bark, and filtered it through a coarse paper, it afforded a most strong and clear yellow colour.

While the liquor was filtering, I dissolved some common alum in a little fair water, and when the whole was done, poured the yellow liquor into a basin, and gradually put to it some of the solution of alum. By degrees, the liquor curdled, the yellow matter got together, and after a little time, I put this also into a funnel, lined with the same coarse paper, to filter.

When all the liquor was come off, there remained a fine strong yellow matter: to this I put fresh water, without taking it out of the filter, and when this liquor had run thro' I put in more water, till there was no taste of alum in the clear liquor that came through the filter. There now remained, in the paper within the funnel, an exceeding fine yellow pulpy substance. I laid the paper, with this upon it, on a chalk stone, which presently sucked up the greater part of the moisture; and then taking it off from the paper with the ivory knife, I laid it on another, and laying that on the chalk stone, left it to be perfectly dried.

Thus I obtained a fine paint, the same thing in yellow, that carmine is in red; which I have used in the colouring some figures of plants, and which has stood to this time

unaltered, and has been particularly admired by all who have looked upon the figures.

This is all I have had opportunities of doing by way of proof, of the use of the bark of buckthorn in dying; but I think there is no room to doubt that it will answer that purpose, since the colour I obtained in a solid form, was no other than what had before been in the liquor; and any dying liquor, made from a vegetable substance, will, by the same procedure, which is well known to the lake makers, afford its colour in the same form. Logwood, which makes a fine red liquor for dying, affords, in the same manner, a fine bodied colour; and so do the generality of others. Dr. Shaw, who has delivered the general method of making the lake colours, in very expressive accurate terms, hints, that the production of many new paints and dyes may be discovered by such experiments; and this bark, so easily obtained in any quantity, promises very fairly to be one. It would cost the farmer very little to try: one of the premiums of the society before named, would be a sufficient inducement to him to make the experiment.

#### CHAP. LXXXI.

##### *Of the black alder.*

THERE is a second shrub of the nature, in some degree, of the buckthorn, which should not be omitted when we have mentioned the last; though it is inferior in its qualities, and more limited in its use: this is the black alder. Its bark, in the same manner as that of the buckthorn, gives a yellow colour, and may deserve trial: it is a paler yellow than the other; and has nothing of the purplish hue of that, but it is not less elegant. The berries of this shrub also contain a green colour, which will answer very well in the colouring woollen cloths.

The disadvantage that attends this is, that it is a weak and ill-growing shrub, easily broke, even so as to have obtained its common Latin name thence, *FRANGULA*; and that it is destitute of thorns. It cannot therefore answer as a hedge shrub, nor be brought into universal use so easily: but since it certainly contains these useful principles, it will be very well worth while to raise it in those places; where there are soils that give the opportunity; especially as those grounds are good for little else.

If the farmer have a piece of boggy or wet ground about the skirt of a coppice, he can plant nothing that will grow better in it than this shrub. We see an instance of this near London, on Hampstead-heath, where the shrub flourishes in a hedge, where the water of the principal bog discharges itself; and where enough of the bark may be, at any time, procured for a trial.

There is also another reason why it would be worth while to raise it in particular places; for the striped branches have their use. They burn to a kind of charcoal which is very useful in gunpowder: and consequently, if the farmer, who shall raise it, live in the neighbourhood of a powder-mill, his produce will be of so much the more value. These considerations should always be kept in mind, and what we propose to the husbandman, should claim also, in a peculiar manner, the regard of country gentlemen. They can best run the little risque there is in trials of things proposed for publick utility, and a patriot spirit could never exert itself more honourably. The raising a few of these shrubs would be no expence, and such persons have influence, by means of their connections and dependants, to bring these things to a trial. The expence at which this nation imports many of the ingredients used in dying, is a very considerable thing, and there is reason to believe a great part of it may be saved by making a proper use of the produce of our own country.

#### CHAP. LXXXII.

##### *Of water hoarhound.*

UNDER the consideration of colours for the use of dying, which may be obtained from the products of our own kingdom, it would be wrong to overlook the antient black, which our ancestors obtained from *WATER HOARHOUND*, a weed so abundant on the sides of ditches, that we need not recommend its culture, only the gathering of it where nature offers it. The use of galls has superseded that of this plant, because they are more easily managed; but it is not always that the most convenient ingredients are the best. We have taught the Chinese the art of colouring their ware with powder blue, which they did before with an ingredient of a superior nature, made by themselves. But the China ware is the worse for it; and they have reason, who prefer the old blue so vastly.

Perhaps



Perhaps something of this nature may have happened with regard to this plant. The black, which we dye in England, is not nearly equal to that of France. Those who have the secret there, are wise enough to preserve it; but it would be no unnatural thought to suppose they may use ingredients we do not. Whether this be at all the case, is impossible to say; much less whether this herb be one; yet there are circumstances that point out something like it.

Many years since I saw, in the west of England, coarse woollen stockings, which the farmers wives had made from the shearings of their own flock, and died with this herb and copperas. I remember that the deepness of the colour appeared particular to me at that time, and was indeed the reason of my enquiring with what it had been done. In France also, it is certain, this herb is gathered for some purposes in many parts of the kingdom, and is sold dry as well as green. I am not aware of any other use of it, for it is unknown in medicine. If we put these circumstances together, may there not appear a probability that the French use this plant in their black dye? Probably it would not answer well, or not conveniently alone; but it is worth a trial, if our dyers could be brought to make it, whether this plant may not be employed to advantage, particularly in the dying of the fine black cloths, either alone or with galls; and in what proportion.

If it should be found of use in this respect, the quantity of it which nature offers on the banks of our ditches, is very great; but we need not be limited to this alone, for nothing can be more easy, than to propagate it in abundance: the root is perennial and spreading, and the place of growth is land of no other value. The sides of ditches always waste some ground, and these are the natural place of the plant: it is abundant throughout the neighbourhood of London; and indeed, so far as I have seen, through the whole kingdom. The farmer who has a mind to see it growing, may find abundance of it on the ditch-bank going to Ranelagh, a little on the side of the bridge that goes over the Chelsea water-works. It might be planted as we have directed, for buckbean; and every piece of the root would grow: the banks would soon be covered.

#### C H A P. LXXXIII.

##### *Of devil's bit.*

**T**HERE is a kind of scabious common in our meadow and pasture grounds, the flowers of which are of a fine deep blue, and of a globular shape; they ripen in the beginning of July. The leaves of this plant contain so strong a juice, that it is used in many places in dying, and might perhaps be also useful here. The root appears bitten off towards the bottom, for which reason it is called devil's bit; a name given also, for the same reason, to a kind of hawkweed, and some other plants, whose virtues (according to the fables of those times) the devil was supposed to have envied to mankind: but this will easily be known from all the others, by the fresh and strong green colour of its leaves, and the beautiful blue of its flowers.

The juice the leaves contain is of the nature of that of the leaves of woad well known in the dying trade, only that it is of a pure and perfect green. The Swedes, who use it for dying woollen goods, call it by a name expressing a kind of woad.

The plant is so common in our pastures, and there is so much appearance of its answering to the character given of it by those who have used it in the northern nations, that certainly it will be worth gathering and trying. The management of the leaves should be the same with that of the leaves of woad, which we have directed at large in a preceding part of this work, and need not repeat here; and as it would cost only gathering for a trial, we cannot but recommend it. The leaves should be taken up in May, before the stalks appear, for they then contain the richest and the most abundant juice. If the success answers what is related of it, the propagation will be very easy, for it is a perennial plant, and encreases at the root abundantly.

#### C H A P. LXXXIV.

##### *Of squinancywort.*

**W**HERE we have positive knowledge, we shall enlarge upon the articles proposed for the improvement of the farmer's business: but where only the report of others comes before us without personal experience, less will be said upon the subject: but as the intent is to cover ground of little value with useful products, we shall omit nothing which comes recommended upon good authority. We treat here of a small and unconsidered weed, common enough upon

some grounds, which produce little of value, and capable of being produced abundantly in others; concerning which we have undoubted testimony, not only that it may be used in dying, but that it is successfully in some parts of the world: supplying the place of Madder.

Squinancywort is a plant of the same class with madder, though much smaller; and we have observed, in the introduction to this part of our work, that plants of the same class usually possess the same qualities; therefore, it is reasonable to suppose, that there is truth in what is asserted concerning its use in dying. Farther north the plant is yet more common than with us, and there is undoubted testimony, that it is there used for a red colour successfully. We are, with great pains, introducing, at this time, the culture of madder in this kingdom; and there is reason to think we shall succeed; but though we should not raise that plant, which is a native of another kingdom, there can be no doubt of our succeeding in this, which is an absolute weed in our own. And there is a farther advantage, that, whereas madder requires a rich soil, this plant will thrive upon the very barrenest hilly grounds.

#### C H A P. LXXXV.

##### *Description of the plant.*

**S**QUINANCY WORT is a low small herb, of a fresh green colour. The root is large and long, of a deep colour on the outside, and of an orange hue within. The stalks are smooth and about eight inches high; the leaves are also smooth and narrow; they grow about the lower part of the plant, four at a joint, and in the upper part two. The flowers stand at the top in a kind of tuft, and they are little and reddish: sometimes they are white, but in those plants, which have the flowers of the reddish tinge, there is usually some red also on the lower part of the stalk, and the root of such is best. It is a singular observation, that in the northern countries, where this root is used at this time instead of madder, the flowers are constantly white. With us they are usually reddish, and we have therefore more reason to depend upon the colour from the root.

We have it common enough on hilly ground. The Sussex hills, and those in Cambridgeshire, abound with it, where the soil is chalky; and I saw a great deal of it very fine, upon a hill near High Wycombe, last year.

In any of these places, or in others of a like kind, enough of the root may be taken up to make a fair trial; and if it shall be found to succeed, nothing can be easier than cultivating it on those hilly places, where we find it naturally wild.

One thing I have also observed, which may lead us to think, that without planting or raising it by art, we shall not give it a fair trial.

On the hills near Wycombe, there is a considerable covering of grass of some length on the ground wherein it grows; on the downs in Sussex the grass is shorter, and in some parts of Cambridgeshire I have seen it on hilly land, where there was stone just under the coat of the earth, and where that surface was bare. The condition of the root varies constantly according to this difference: where the grass is most in quantity, the root of the squinancy wort is palest, where that is shorter and less, as on the downs, the root of this plant is more coloured; and most of all where it is naked. The reason is not difficult to guess, for the perfection of several roots depends upon the dryness of the soil wherein they grow; and the power of the sun: Valerian root, so famous in nervous disorders, never has its virtue, except when it has grown on heaths; and vines yield no good wine, except the roots run near the surface, where the sun can warm them.

For these reasons, and from what we see in experience, probably the roots of this plant will succeed much better when they are raised in cultivated ground, than they do naturally under a coat of grass: they will be large, because they will have more nourishment, and they will be better coloured, because they are more open to the sun. This should direct the first trial to be made with roots taken up on bare hills; and even these will be inferior to what would be raised by culture.

The owner of land, which is of the proper kind, is interested in this discovery; for he may encrease its value many times over, and he will all the time be doing the most acceptable service to his country.



## C H A P. LXXXVI.

*Of bastard alkanet.*

WE are to add to the roots which may be useful in dying, that of a weed common in our corn fields, and which we have for many ages known by the name of bastard alkanet; though we never tried how far it would imitate the qualities of that plant, from the resemblance to whose exterior form it gained this appellation. The qualities of alkanet we know very well; and those from whom we purchase that root, make us pay a very large price for it. This we have at home, and there is all the reason imaginable to believe it contains the same properties: perhaps in a more remiss degree; perhaps not. The redness of the root has appeared so peculiar to the botanical writers, that they have in general made that circumstance a part of its name; and in Denmark it is a common paint among the vulgar.

It is one of those roots very well worth trying here; and hence it grows wild in our cultivated lands, on almost all soils, and in none is better conditioned than on the poorest, there is no doubt but that if cultivated as other useful herbs, and allowed fields alone, it would be much finer than we now see it.

The plant is a foot and half high, with a few rough leaves, and little white flowers; an unsightly weed. The time for pulling up the roots for trial of their colour, should be a little before the stalk rises for flowering; for that is the time when the juices of the root are in their highest perfection. Enough of it might be pulled up in a few hours in most places; and a trial may be made in the manner of that, the particulars of which have been given in the account of the buckthornbark, a private person cannot well do more; for the dyers is a business not to be understood without due information; and he would be very rash, who should judge a thing incapable of use, because he did not know how to use it in a profession which he does not understand. The best trial would be to get a dyer honestly to use it. And this, though perhaps too difficult to be brought about by a private person, might be rendered easy by the assistance of that society we have named.

## C H A P. LXXXVII.

*Of root cochineal.*

TO the vegetables which may be used in dying, we are to add an insect which our own fields afford, and which has hitherto been neglected by us; though in Poland, and some other of the northern nations, it affords a colour so like the scarlet grain, that it has been called by a like name.

The insect lives about the roots of plants, and thence has been called the root kermes, and root cochineal; as also the root grain, the Polish grain, and Polish cochineal.

This creature, which is small and roundish in shape, is found in Poland, about the roots of a peculiar species of knot grass, or scleranthus; and it has been imagined, that it belonged solely to that plant, and was its natural production. In the same manner kermes, or the scarlet grain, was once thought to be the fruit of the shrub that bears it; and cochineal the seed of the opuntia. The enquiries of those who study natural history, have now taught us better: we know these several kinds are insects feeding on those trees and plants, and such is the root cochineal. We have in England the plant from which this valuable dye is obtained in Poland; nor is it peculiar, as has been thought, to that one kind alone: but there yet remains a doubt whether the same insect, found at the roots of other plants, has, or has not, the same qualities. For the herb from which it is gathered in Poland, though a native of England, is not common here; though some others which afford the same opportunity are.

This is a point that must not rashly be determined: it is of consequence enough to deserve a trial; and we must have experience for it, not opinion.

Plumier found, on several kinds of trees, the very same insect, which, when taken from the opuntia, is true cochineal; but though these had all the other characters and qualities of the animal, they had not the colour. This, however, is no proof against what we wish in the present instance, for the fruit of the opuntia has a red juice, which might naturally be supposed to fill the animal which fed on it; for it will turn the urine of those who eat it red: but there is no such juice in the knot grass, on which the Polish insects feed; and it is therefore natural enough to think, the dye is in the creature itself originally, and is not

dependant upon what it eats. If so, it is certain we ought to push the enquiry; for we have it in England.

I have found it at the roots of some of the common hawkweeds; at those of the purple spurry in Hyde-park, and at the heads of the roots of several grasses, especially in high and dry soils.

Experiments made with these, would shew whether or not they have the colour; and if they have, it will be soon found also on what roots they delight to feed.

The care of so small an insect may appear at first a strange proposal; but in the things used in commerce, great attention is paid to lesser things. The cochineal, of such vast importance to the Spaniards, is an insect very little larger than this; and yet it is regularly bred, and managed upon the plant whereon it feeds. The same kind of care would doubtless answer as well, in respect to the propagation and produce of this kind: the only question is, whether in England it affords the colour which is its only value.

Since the writing the preceding account, I found a vast quantity of these insects about the roots of the common creeping MOUSE-EAR, on a bank near Paddington; and taking up the same plant in other places, I have observed that this creature generally, but not universally, is found about it.

## C H A P. LXXXVIII.

*Of wild marjoram.*

THE wild marjoram or origanum, which decorates our road sides in many parts of England, and which is used in medicine; is in Sweden put also to the service of a colouring herb in dying. There is, in the transactions of the academy at Stockholm, an account of its effect on woollen manufactures; and the colour it is said to give them is a strong, but not elegant purple. These things are abundantly worth trying here; for it is possible, that if employed alone with more skill, their colour might prove better; and it is beyond all doubt, that in various mixtures they would be also useful. The colour nature spreads upon the stalk and flowery heads of this plant, was the first indication the Swedes received of this quality in it; and perhaps there may be some good use made of this, by extending the trial to such plants, as naturally change to fine and glowing colours, at or after their maturity.

The common cranebill, called herb Robert, has always a red stalk; and toward autumn, the whole plant becomes of a very high and florid scarlet. This happens long before its period of decay, for it continues in this state flowering and ripening seeds. The tutsan is another very remarkable instance among the plants of our own growth; and among those we have from other countries the common creeper: the leaves of this often turn wholly red in autumn. The Swedish observation would lead one to examine, whether these plants do not at all times contain a red juice, capable of use in dying; though it is only at one season they shew it in their leaves.

## C H A P. LXXXIX.

*Of the crustaceous liverworts.*

THE old names of plants have been given often idly and arbitrarily; and from their having been attributed to various plants, we scarce know, in many writers who have not considered botany, what is meant by them. This name liverwort is an instance: we call a green leafy substance thus, which is found on the sides of wells; and a grey one upon heaths supposed to cure the bite of a mad dog: but what we mention in the present instance, as useful in dying, is a very different kind from both. Its place of growth is the bare surface of a rock, and its form no other than that of a grey crust, with a few hollow parts which are its flowers; brown in the middle, and white round the edge.

We import from the Canaries a substance very much of the nature of this, though of a somewhat different form; and there is evidence from experience made in other countries, that this has equal value. It tinges any thing with a fine deep purple colour. Nor is this the only substance of the same kind to be found in our country, which may be of service in dying: it may be in our power not only to supply the place of the orcelle of the Canaries from products, which nature offers to us at home, but to excel it. The moss kinds have many great qualities, which have not been regarded sufficiently; and this of containing a valuable colour is one. If the present species should be found useful in England, there is abundance of it to be collected in many places; not only the surfaces of rocks are covered with it, but old walls, and any other place where stone is exposed



poised to the western quarter of the heavens: this is not the only quarter, but it is the principal where this moss is found. We see our churches, which stand very much exposed on the west front, covered with it; while the sides and opposite end are not without it, but have it in much less quantity.

Dillenius, who has published a history of the mosses, mentions this species as being able to afford an elegant red dye; and he quotes an author of great credit, Celsus, for the observation. We find also, upon enquiry, that the people in many of the northern kingdoms use it; nor is this the only kind which has that natural quality: there is a common grey moss that grows on pales and trees, ragged at the edges, and black underneath, which the same people use also in dying the same elegant colour: and Linnaeus, in his peregrinations, made the same observation, and mentions, in very particular terms, the extreme beauty of the colour. These are common in England, and may be collected with little labour, and in vast abundance; nor is there any fear of destroying them by gathering.

The gardener knows when he clears his orchard trees of moss, that it is very ready in its growth again; and that on old boards much more, and on rocks most of all. The reason is plain; the roots are perennial, and getting into the crevices, they cannot be dislodged by taking off the superficial part. Every piece of them is ready to shoot up a new plant; and the clearing away the old surface, only gives it air for the new shooting. This is the case in the perennial rooted mushrooms, as has been lately most distinctly shewn, on account of the Italian mushroom stone. The roots lie buried, and at certain periods send up new plants; and the part where they reach the air, is always fertile. Therefore in this case, an old barn that is covered with one of these kinds of moss, may be a considerable addition to the farmer's income; especially an old wall, or the western surface of a stony hill. There is no probability that men of so distinguished characters as Celsus and Dillenius, Linnaeus and the rest, who assert the fact upon their own knowledge, should deceive mankind. One of their names would be sufficient authority; and the thing being established, the rest follows: the advantage is certain, and all that should excite our wonder is the long neglect.

The first kind we have mentioned is so thick, that the quantity, even from a moderate extent of wall, would be very great. Micheli, who had considered the mosses with attention, mentions the extreme thickness of the masses in this, even in the name of it, and calls it the thickest of all. The trial would be easy; and if they prove equal to what we import at a large price, the benefit is not confined to the farmer, who has the immediate profit, but extends to the whole nation.

These are not all the moss kinds from which we may expect this benefit. Our excellent Mr. Ray mentions two sorts of the same crustaceous class, which shew their purple colour externally, and are useful in dying. The one has purple hairy leaves, and spreads itself in the same way with those already named, on stones and walls. The other has broader leaves, with smooth edges, and has a kind of bladders at its edges; this also grows on stones. Both these have the dying quality strong in them; and both may be had in quantity in many parts of England.

These, like the first named kind, afford a purple dye; but the use of the mosses in this article is not limited to that colour. Every one must have observed, that common yellow crustaceous moss, which makes a kind of golden roses on old brick walls and boards every where about London, and throughout the kingdom. The quantity we have of this is so great, that supposing it to be of any use, the abundance of it is a great article in its recommendation; and this very kind, Linnaeus assures us, is used in Sweden in dying, affording a very elegant and lasting yellow.

These things, if brought into use, will be so many additions to the publick wealth, as well as private property; and the farmer, as well as the country gentleman, have power to try them, and are interested in it.

In the directions we have given in a preceding part of this book, for the working up such of the wooll as is to be for the service of the farmer's family, we have directed some cheap and common ingredients for dying it: these which we have here added may be tried in the same manner; they are all familiar and common, and they will save even the small expence of the purchase of the others, and at the same time will shew what may be expected farther from them; how far experience in England will support the doctrine of other countries, and which of them may be most worth beginning to introduce to the publick.

## C H A P. XC.

*Of some peculiar kinds of grass.*

WE have taken occasion before to name the abundance and variety of English grasses; but it may be useful here to consider the purposes to which this great variety may be made subservient for the convenience and advantage of life, for nature did not make them in vain.

We have, in many parts of this kingdom, a long rooted plant of the cyprus kind, which the writers on botany call LONG-ROOTED, EASTARD CYPERUS. It is easily known by the farmer, for it is very tall, and has tufts of brown heads, like those of rushes growing one above another, all the way by the stalk. The stalk itself is round, but the leaves are three edged, and each edge is notched like the teeth of a saw. Mr. Ray mentions it in Cambridgeshire, Warwickshire, and Cornwall; and I have seen it in most other counties. Its natural place of growing is the moist wet ground; and the farmer who has such will find his use in planting it. A very little trouble will do this, for its roots are long and large, and there is no plant which spreads them so abundantly.

The worst piece of wet ground whereon nothing would grow, will, by a few of these roots, be soon covered with a thick and firm turf; producing abundance of the grass, and rendering the place passable. The grass is harsh when full grown; but while the leaves are young and tender, cattle will eat it, and nothing is more nourishing. After this it grows to a very considerable height, and is then of all things the most excellent by way of thatch. Its use in Norway has led the other northern kingdoms to a knowledge of it; and though it is so frequent in their wet grounds, that it need not be planted, they mow it annually for this purpose, and find it lasts in thatch beyond any other materials whatsoever. The necessities of the poorer people in many parts of England, reduce them to have recourse to this sort of covering for their houses, and it would be greatly to their advantage to use this kind. The common thatch, even of the best sort used with us, is liable to grow mouldy, and decay in a very little time, and always gives habitation to vermin: on the contrary, this lasts many years, and is not subject to that inconvenience. Whatever is the reason, it is observed in Denmark that even birds do not build in it. There is nothing disgusting in it, to our apprehensions; on the contrary, it is the sweetest and cleanest of all the straw or hay kind; and there is great advantage in being free from vermin without any inconvenience. All the time the ground whereon this should be planted, is what would bear nothing else; and is even reduced by this plant to a state of utility which it had not before.

The matting together of the roots of this plant is so strong, that many of the floating islands upon the northern lakes are formed of nothing else; and after it has grown sometime upon such a ground, the moisture being in great measure imbibed by the roots, and the whole reduced to a firm substance, the stuff may be cut up to the depth of three-spades for fuel. It makes a kind of turf, not equal to the true peat, but very useful where that is wanting.

## C H A P. XCI.

*Of millet cyprus grass.*

THIS is another of the grass kind wherewith the farmer should be acquainted; for there are peculiar spots on which it will be very useful, affording an abundant growth of excellent food for cattle, though nothing else would grow upon the place.

It is a large and thick tufted grass. The leaves are numerous, and very long; they are often near a yard in length, and their colour is a fresh and delicate green; they are of a tender substance, and the edges are a little rough. Vast multitudes of these rise from the heads of the roots, and spread every way. They afford an excellent nourishment; and horses, oxen, and sheep, are all equally fond of them.

The stalk is a yard high, and has several tufts of blackish rushy flowers, growing upon it one over another. While it is young and tender, the cattle are as fond of it as of the leaves; and indeed it is equally juicy, and is in a manner covered with them: four, five, or six leaves usually growing on a stalk, and each surrounding it a great way at the base.

The ground on which this grass delights to grow is wet and shady. These are qualities that render it unfit for any other good kind; and the farmer often has such on



his land. I have seen it covering the ditch sides, round the edges of woods, with a luxuriant quantity of excellent verdure, where, without it, there would have been nothing.

If the husbandman, or country gentleman, have any spot of this kind, let him in autumn order a few roots of this to be planted, one at every yard distance, and they will soon meet and cover the whole ground; and from a piece of land which was before utterly useless, he will have the advantage of better produce, than can be found on any piece of equal extent upon his ground. No shade is too much for this grass. I have even seen it luxuriant in the middle of thick woods; and in beech woods in particular, where there are plashy places, it may be planted to a very great account, the ground being able to produce nothing else of any value; and the growth of this, in ever so large a quantity, being no way hurtful to the trees.

The farmer who has a mind to see the plant, may find it by the side of that little ditch, which wets a great part of the road from Pancras to Kentish town, and he will know it by our description. If he observes with what greediness cattle eat it, he will see we have spoke with reason as to their fondness for it; and he will find, by the sequel, that it is not less wholesome than pleasant.

#### C H A P. XCII.

##### *Of club headed rush.*

**T**HE common rushes produce their flowers toward the top, but not absolutely at the top of the stalk; they burst out sideways at a little distance below the summit: but there is one kind which, on the contrary, bears them at the very top in form of a club: it has been, for that reason, called the club headed rush, and it is this of which we speak here. It grows in brooks and rivulets in vast abundance, and sometimes on very wet ground. We would have the farmer know the use of every thing; and this which he usually neglects, and suffers to decay where it is, will save him a great deal in the feeding up of his hogs, answering the purpose of pease, and giving the fat of those creatures more firmness, and a better flavour.

There is nothing they are so fond of; and they devour the whole, root as well as rushes. Let the farmer, who has a quantity of this plant in his waters, drag it out as he wants it, and give it the hogs as they are feeding up. Wherever he drags it out, let him leave a few roots, and there will soon be an abundant supply again; or if he has water proper for the produce when there is yet none, let him take up a few bunches from some neighbouring brook, and just put them into the side of his own water, fastening them with pegs to the bank; they will quickly fix themselves, and spread over the water. He cannot mistake the kind of rush, for the club-like head is a plain and distinctive character, and there is no care required to make it grow; on the contrary, when it has once got footing, nothing is more difficult than to extirpate it: for every fragment of the root that happens to be left in the water, will float to the bank, and there fixing itself, will begin the propagation of a new quantity.

Hogs are not the only creatures which will eat it, horses are fond of it; and I have always seen that it agreed with them, and was a healthy and heartening food.

If the profit from such articles as these be small, the expence is nothing. They grow where no other useful produce would; and every little addition is worth the farmer's notice. Many a brook that runs for miles through a farmer's ground, is covered with this plant, which grows and dies unregarded; though if the expence alone of gathering it were allowed, the brook would be equal in value to several acres of the best of the ground.

#### C H A P. XCIII.

##### *Of spiked reed grass.*

**T**HIS is another of the water grasses, which often grow unregarded by rivers, and which may be easily made to cover the useless ground about the banks of brooks and ditches, with a most valuable food for cattle.

The grass is common enough, and easily distinguished. The leaves rise in loose tufts, and they are large and broad; they resemble in shape the leaves of reeds, but that they are something smaller; and their colour is the same whitish or greyish green.

The stalk is five foot high. It is jointed, and has leaves on it like those from the root; and at its top stands a spike of an irregular form, like that upon the rough-leaved grass in meadows. This is not large in proportion to the plant:

it is naturally of a greyish white, but sometimes it glows with a tinge of purple.

The natural place of growth of this grass, is the wet side of a ditch, pond, or brook. Sour and useless grasses often naturally grow in such places; and it will be vastly worth the farmers while to destroy these, and raise the present kind in their place.

It may be propagated either by the seed or root; but the root is the most certain way, and the trouble is very little. The labour of a few days in autumn will destroy one sort, and plant the other: and one planting is sufficient, for it is natural to that kind of ground, and never will decay upon it.

The manner of planting should be the same in all these kinds; when the growth already upon the spot is rank and utterly useless, it should be torn up and destroyed, and a sufficient quantity of the roots of the proper kind should be planted in its place. When the natural growth is not of this bad character, it will be enough to open the surface in various places, and let in some of the roots of the better kind, which will soon make their way, and produce largely.

This is more needed throughout the kingdom than can be well imagined: even in the pastures about London, where food for cattle is of such vast value, it is surprising what a loss is suffered by the neglect. I have observed in many of these grounds, the ditch banks, and the pasture for some space beyond them, covered with grasses and rushes which no creature will eat; while they would have produced this excellent reed grass in such abundance, as to have equalled a considerable portion of the best of the ground. There are no cattle, of whatsoever kind, but eat this greedily; and it affords abundant and excellent nourishment. The farmer's care, when he has this grass naturally, or by his own good conduct, on the ground, must be to prevent its running up to stalk; for that exhausts the root, and prevents the free growth of the leaves, and their due nourishment. This is very easily done; for a labourer going along the ground with a scythe, may cut off all the stalks at a small height above the leaves with a few strokes: and once doing this is sufficient; for when the flowering root is taken off in this grass, it sends up no other till the next year.

#### C H A P. XCIV.

##### *Of mouse-tail grass.*

**O**UR farmers distinguish two or three particular kinds of grass, which they find excellent in pasturage, but they might very advantageously carry that observation a great deal farther. The grass called the greater mouse-tail grass, and by some the long ear'd cat's-tail grass, always affords excellent feeding, and at the time of mowing, a sweet hay.

It grows most favourably in damp meadows; and it should be by all means encouraged in them, not only because it is a very sweet grass in itself, but because the same ground is very apt to yield what is of a contrary quality.

The farmer needs not tear up other grass for this, nor plant it root by root: we are not about to recommend to him practices so chimerical; but by a very easy process, he may enrich his worst wet meadow land with this to great advantage.

First let him know the kind distinctly. The leaves are very numerous, and they are narrow; sharp pointed, and of a fresh and fine green. The stalk is two foot high; and at its top stands a long and slender ear; rounded and somewhat harsh to the touch, and armed with short upright beards. At first it is green; but when it grows toward ripeness, it becomes purplish. This is the natural state; but sometimes from defective nourishment it is white. The leaves of this are eaten generally by all sorts of cattle, the larger and the smaller equally; and there is none whose stalks succeed better in hay. It is the best grass a wet meadow can bear; therefore let the farmer get it into all such ground.

At the time of hay ripening, let him look over his own and his neighbours grounds, and mark a field that has a great deal of this grass. Let him observe when this is cut, and where the hay is carried; and let him collect a large quantity of hay-seed from it; and in the time of his spreading his manure, let him sow this seed largely upon the ground. It will readily grow, because the soil is such as it most naturally loves, and the increase in quantity will be very great, as well as the improvement in the quality of the grass and hay.

We have, in the preceding volumes, directed the farmer in



in the choice of hay-seed, always to have a regard to the place from whence it is obtained. But it is an article of yet more advantage, to select a piece of ground for the choice of seed, where a kind of grass has made the principal part of the crop, that is not only perfectly suited to the soil, but is also excellent in itself.

## C H A P. XCV.

*Great water grass.*

**I**F the farmer has a piece of ground that is yet wetter than that we have last understood, under the name of the more damp kind of meadows, let him not attempt to raise in it the grass there described; for it will bear only a certain degree of moisture: but he is not without resource in that case, provided he knows the several kinds of useful grasses. This which we treat of in the present chapter, will grow in the very wettest pasture ground; and its large leaves and quick shoot after cropping, make it a source of great plenty. No grass is superior to it in its qualities of feeding oxen and sheep, with an innocent and rich nourishment.

That he may know this grass, let him observe the following characters. The leaves are numerous; and they are of a pale green, large, and considerably broad: they rise in great clusters, and grow again very quick after feeding or cutting. The stalk is slender jointed; of a pale whitish green, and five foot high. The flowers grow in spreading heads, composed of small spikes. They are of a pale brown colour, and they have no beards or awns.

The grass is not uncommon in the damp parts of pastures; and it should be raised in the same manner as the preceding, in those grounds that will suit it, by saving hay-seed from such as has been cut where this kind grew in abundance; and sowing this in the latter part of autumn, just before the laying on the manure.

The advantage will be seen in some degree the following summer, and the general crop will be improved by it; but the great benefit will be the year following, when the roots have strengthened themselves, and the grass grows up in thick tufts. It will then be a very fine addition to the crop of hay; and the young shoot of a stalk being cut off in the mowing, for it flowers later than the generality of the meadow grasses, all the strength of the root will be employed to send up leaves during the rest of the summer, which will vastly increase the quantity of food for the cattle. It is not saying too much to affirm, that one fourth of the whole may easily be added to the grass of the generality of pasture grounds, by a proper attention to this one article of sowing hay-seed of right kinds.

## C H A P. XCVI.

*Of tall meadow grass.*

**W**E have mentioned the grasses which are peculiarly suited to such meadow grounds, as are damper than ordinary in different degrees; we here speak of a kind that will grow very successfully upon places that are absolutely watery. Such spots are not uncommon in low meadow grounds; and in the natural course of things, their produce is either less in quantity than that of other spots, or it is inferior in kind: and in some cases there grow in these parts grasses of the rushy kind so coarse, that no cattle whatever will eat them. The grass we mention in the present chapter, will grow successfully in these; and make the product equal to the best of the other parts of the ground. Let the farmer observe it by these characters.

It has somewhat of the look of the common tufted meadow grass, but it is much taller. The leaves are numerous, long, and moderately broad, and their colour is a pale green. The stalk rises to three foot high, and is jointed at large distances: the tuft of flowers is long and large, and it hangs all on one side of the stalk: the grains of which it is composed are brownish, and they have no beards.

Let the farmer look into the wet meadow grounds of his own, and his neighbours farms, and when he has found a spot that abounds with this kind of grass, let him take care to procure seed from the hay, among which it is made, and sow this upon that kind of ground: he will make a vast advantage.

## C H A P. XCVII.

*Of narrow-leaved mountain grass.*

**W**E have hitherto spoke of the grass of meadows and wet places: this is peculiarly adapted to hilly grounds, and is more worth the notice of the country gentleman, as well as farmer, than many which are more conspicuous; its

peculiar quality is agreeing with sheep. It is the most proper food for that creature, and preserves them from diseases, and it gives that peculiar flavour to the flesh, which we admire so much in what is called the Banstead mutton. Add to this, that it grows on the worst soils, and we shall see that it has many recommendations. Its natural quality is to shoot up an innumerable multitude of leaves as fast as they are cropped; and the nearer the root it is gnawed, the more freely they grow. The grass is in itself small and low, but this abundance of it makes amends; and it grows equally at all seasons.

That the farmer who desires credit for his sheep, or the country gentleman who values the flavour of the meat for his own table, may know the kind of grass we have recommended; he is to observe the following characters. It is a low and small sort. The root is fibrous and blackish; the leaves are narrow, short, sharp pointed, and very numerous; and their colour is a strong, but not a florid green. The stalk is about eight inches high; and the tuft at the top is of a pale brown, when ripe. It is composed of a multitude of small heads, without awns, and they are disposed in a feathered manner.

The natural place of growth of this kind is on hilly pastures; and the more dry and exposed they are, the more likely it is to be found there. The spot is to be marked where such grass is suffered to stand for hay; and seed is to be saved from it. This should be sown on the same kind of ground, for it will not take root on any other; and the more exposed the pasture is, the better it will grow. The sheep will find it out before the eye of the farmer; for he will perceive they are fond of that place in particular, and thrive in it: and from that time he will see the turf thicken on the ground.

## C H A P. XCVIII.

*Of knotty-rooted oat grass.*

**T**HIS is a grass which grows in ground choaked up with bushes, and finds its nourishment almost under any disadvantages; at the same time it is a very rich and wholesome food for cattle. Our farmer will understand his interest too well, to have any grounds over-run with shrubs; but from this direction of nature, as to the place of growth of that grass, he may find a lesson of advantage. The hedge sides in his pasture grounds are the least profitable part; but by sowing this grass on that part of the ground, he will bring it to a condition, at least equal in value to any of the other.

The roots of this grass are composed of many thick and knotty joints; they are of a brown or blackish colour, and hung about with many fibres. The leaves are of a fresh green, moderately broad and sharp pointed. The stalk is two foot and a half high, and the tuft of flowers lean on one side; these are composed of pale brown heads, and every other of them has a small beard, the intermediate ones being naked. The root is the great article of distinction to the farmer. If on pulling it up, he finds that to consist of a chain of knotty pieces, he may be sure he is right.

The seed of this he is to save from hay, among which there is a great deal of it; and he must sow it along the hedge sides in his pastures. The shoot will be but thin the first season; but by the second, he will see the reward of his trouble: he will know the blades of this grass by their height and colour; and he will find the edges of his pasture are by this means not only as well covered as the middle, but that the cattle feed upon this part more luxuriously than the rest, and no grass is more nourishing or wholesome.

Only one caution he is to take, which is to keep hogs carefully out of any pasture where this grass is sown. The knotty roots of this kind, are the greatest delicacy that hogs know; and they will tear up all the ground for them wherever they smell them. I have seen a hog root up two yards of earth on a common, for the sake of two or three roots of this grass; we may guess therefore what would be the consequence of their getting in, where it was abundant.

## C H A P. XCIX.

*Of sea dogs grass.*

**T**HE use of this grass is of a very limited nature, but it is worth the farmer's knowledge. It naturally grows upon the sea coast, and it will not succeed any where else, nor is its use so great as that of the others: but there is in England a great deal of sandy coast, which is at present of no use or value, on which this might be sown with very little



little expence or trouble, and where it would grow readily.

It is a tall and harsh-looking grass; the roots creep in the manner of couch grass, and at least as fast, and as far. They are white and well tasted. The leaves are long, and considerably broad; their colour is a bluish green, and they are of a very firm substance. The stalk is a yard high, or more; and at the top of it stands an ear like that of wheat, but that it is thinner.

The natural place of growth of this grass, with these characters, will prevent the farmer from being deceived in the kind; and it is so common in many places about our coast, that a labourer may, in half an hour, mow enough of it for seed for an acre. Let the farmer thrash it when it is dry, and in the following autumn sow it upon a piece of ground of this kind. The first good effect of it will be to fix the sand, which was before blown about by every wind. This service it performs in Holland, to the great benefit of many places there; and this it will do securely, though the matter be ever so loose. The leaves while young, are an excellent food for sheep. Oxen and horses will eat them, when they are more grown.

The roots which are spread over the ground in a vast abundance, are an excellent food for hogs. They have also another use, to which I hope we shall never have occasion to put them in England; they make wholesome bread. In some of the northern kingdoms, they are gathered and sold in seasons of scarcity for this service; and the people find them as healthful as corn.

#### CHAP. C.

##### *Of vipers bugloss.*

WE are making the farmer acquainted with herbs which may be beneficial to him, and which are not commonly known for those services. This is of a peculiar kind; its use is for honey: but it is so easily propagated, and so agreeable a plant to look at, that it will be worth the care of the farmer, who has any quantity of bees.

It is very conspicuous on our dry ditch banks, and very beautiful. The stalk is spotted with red; the leaves are rough, and the flowers are of a beautiful blue, and they are considerably large.

If a few of these plants be pulled up when the seeds are ripe, these will be easily shook out, and being scattered over the ground in the farmer's yard under walls, and upon the walls themselves, they will shoot regularly the next spring, and produce abundance of plants, which will flower in perfection the same summer. After this the plant will take care of itself; and every year there will be abundance of it on the ground. The love the bees have for it, will be seen by the great attention they shew its flowers; and the effect will be found in the honey, which will be not only the finer, but the more in quantity in proportion, as they feed more largely on this plant.

#### CHAP. CI.

##### *Of the black Currant.*

THE small shrub, which produces this fruit, is very well worth the farmer's notice; and perhaps may prove of greater importance than has yet been known. It is a native of England, and is hardy enough to live any where in hedges. It must not be considered as a proper shrub to make the fence; but it may very well be planted here and there among the rest for the sake of its fruit.

We were long acquainted with the use of these in tarts before Mr. Baker, a very worthy member of the royal society, revived their use in sore throats, for which they were formerly so famous in England, that the shrub was called *Squinancy wort*, that is, *Quinzy herb*; and for which we do not at this time know a greater medicine.

It has been long known in France, that this fruit is good for the feverish disposition of cattle, and that when a purging comes on with such an illness, it is a sovereign remedy. Instinct directs cattle to find it where it is native, and if it were planted in hedges, they would not fail to seek it out for their own benefit. The terrible disease among the horned cattle, which has raged so many years throughout great part of Europe, always is attended with an inflammation of the throat, which continues through the whole intestinal canal. From what we know of the great effects of this fruit in sore throats among our own species; and in the purgings and feverish illnesses of cattle, may it not be reasonable to expect great good from it in this terrible disorder.

#### CHAP. CII.

##### *Of avens.*

THE farmer will see avens plentiful enough unsown in his hedges, and he may find great use in the roots of it for the preserving his malt liquors.

The plant is two feet high, with broad rough divided leaves, each consisting of two pairs of smaller, and an odd one that is much broader than the rest. The flowers are little and yellow, and the seeds stand in a kind of roundish heads, which hang to the cloaths in the manner of butts. The root is thick and brown, and has a very agreeable smell.

A small quantity of this put into malt liquor with the hops, prevents it from growing sour: if too much be added, it gives the beer a high spicy flavour, but very agreeable; and there are many families in Norway, where the plant is as common as in England, who chuse this flavour so as never to be satisfied with malt liquor that has it not. It is a constant and certain observation, that the beer, which has this high flavour of the root, never spoils.

#### CHAP. CIII.

##### *Of kidney vetch.*

WE have yet two or three plants to recommend to the farmer, highly worthy of his notice. The common kidney vetch is one; it grows wild with us, principally in dry upland pastures, and will thrive very well in a chalky soil. There is no herb that feeds sheep more successfully, and the quantity is very great that it adds to these pastures.

The plant is very conspicuous, and particular in its aspect. The root runs into the earth with many very long fibres. The stalks are a foot long or more: eight or ten of them rise from each root, and they partly lie upon the ground, and partly rise obliquely upwards. The leaves are formed like those of the vetches; and the flowers stand in cluster'd heads as big as wallnuts. The several pairs of smaller leaves, of which each entire leaf is composed, are oblong and of a pale green; and there is an odd one which terminates the foot-stalk, and is larger than any of the others. The flowers themselves are small, and their most common colour is yellow; but they are sometimes white, which is not very wonderful; and sometimes red, which is more strange. This is indeed so much out of the common course of nature's variations, that the plant has been supposed a distinct species. Linnaeus has a very singular observation on this subject; it is, that the colour of the flowers in this plant is influenced by that of the soil wherein it grows. Yellow we know is natural and original: he observes that they are red when the plant has grown upon a reddish soil, and white when on a white one. This is not perfectly verified by what we see in England; for we have yellow flowers on this plant on our chalk hills; but there may be truths in nature that are not universal, and his authority is not to be questioned. There is the more attention due to this circumstance, because sheep, for whose food we propose it should be raised, are fonder of it when it has yellow flowers than any other colour. This I have observed. Therefore let the farmer save his seed from such plants.

It will take root freely in all dry pastures, whether the soil be chalky, sandy or gravelly; and I have seen it very thick wild in the bottoms of old gravel pits, where the surface was no other than a remain of the same loose stones that had been dug up above, and where not even grass could find nourishment.

This must be a great recommendation of the plant, and its qualities much more. There may be several ways of raising it; but from a small experiment I made last year, I should propose the following as most certain of success.

Let the farmer chuse an upland pasture with a gravelly soil, which has hitherto bore very little grass; he will need do no more than plow this up for the purpose; it will need no clearing, for weeds will not grow in it. Let it be plowed in autumn, and let some seed of the kidney vetch be saved from the wild plants, and mixed with twice its quantity of good and proper hay-seed. We have directed the farmer in his choice already, of the grasses from which it should be saved for particular places.

Let this mixt seed be sown thick upon the land, and harrowed in; and let there be scattered over it a little lime, which has been to be slaked by the air.

No more care is needed; a crop will rise, in which the kidney vetch will have a great share, and toward the middle of the following summer, it should be mowed. The hay will be very valuable; and after this the roots will soon establish



establish themselves so well, that the sheep may be turned into it, as into a common pasture.

It will cure them of all the illnesses they may have contracted by feeding in low wet grounds; and there is no food whatsoever, on which they will thrive so fast. The pasture will keep itself up afterwards for many years; and if at length it be found to grow poor, there will need nothing more than to plow it up, and new sow it again.

It is a great advantage that this plant will grow freely with grass, for there are some excellent ones which will not; but this naturally rises in pastures. The spot upon which I tried it was an old gravel walk, and it succeeded perfectly: I can therefore, from experience, recommend it on gravelly soils; and from what I saw can assure the farmer, not only that sheep feed on it with great pleasure, but that it is wholesome and nourishing for them.

Probably it will answer as well on chalk and sand. The farmer, who is not inclined to make the full trial of it here proposed, may scatter a few seeds in autumn, upon his upland pastures, and mark the consequences. He will be soon led by these to sow it at large.

#### CHAP. CIV.

##### *Tare everlasting.*

**T**HIS is a yellow flowered plant, common in some of our pastures, and worthy to be introduced into them all. The farmer will easily recollect it, by the following short description. The plant is irregularly branched, and a foot and half high; the leaves grow in the manner of tares, only that there are but two at each foot stalk. Their colour is a dusky, and somewhat blueish, green; the flowers are yellow, and shaped like the flowers of the tare, and they grow in tufts on slender foot stalks, from the bosoms of the leaves. After them come pods with roundish seeds, like little tares.

It is common among bushes and in hedges; and in many pastures mixes itself among the grass, from seeds scattered from the hedge plants.

Wherever this happens, it is a great advantage to the ground, for cattle are very fond of it, and it is very nourishing. The farmer has it in his power to make this benefit universal.

Let him order a quantity fit to be gathered when the seeds are hardening, and let it be laid upon a dry bank, and sometimes turned till fit to thrash; then let the seeds be carefully got out, and let them be sown over the pasture ground among the grass, at a time when it has just been cut down at autumn; and the cattle have been turned off, to give it fresh growth. If a small scattering of common manure be thrown on at the same time, it will cover the seeds, and dispose them to shoot; and the next spring the plants will appear in abundance, after which they will never be wanting in the pasture. The name by which the English herbarists call the plant, shews that it is durable in the ground; and indeed, with a tolerable establishment once given, it will never be out of it. It will cut with the hay; and will give that a heartening virtue, beyond what grass can have alone; and it will rise again after the cutting exactly as the grass, and flourish with it; thickening the bottom, and adding greatly to its natural qualities. Horses and oxen, as well as sheep, are very fond of the taste of it; and one as well as another shew always a peculiar liking to the pastures where it grows.

There is no grass ground on which it will refuse to grow; but it succeeds best of all, when there is some moisture. The farmer should consult this; and he should observe also, that in the state of nature it grows very well under the hedges: therefore he should sow it in a larger quantity toward the skirts, than in the middle of his field. It is not conceived how great improvements might be made in grass farming, by these small additions.

#### CHAP. CV.

##### *Of many flowered vetchling.*

**T**HIS is another of the pulse kind, which is a native of England, and which, though it is generally a useless weed in hedges, or a mischievous one among corn, may be made very useful in pasture grounds. The stalks and leaves are an excellent nourishment for all kinds of cattle; and the plant will always sow itself, if once properly introduced into the ground.

The farmer sees it mostly in hedges, where, though useless, it is very beautiful. It grows among the bushes to three or four foot high; and is conspicuous for its long tufts of beautiful purple flowers. The stalks are weak, and of a pale green; the leaves are composed each of two ranges

of small ones, and they are of a pale, or somewhat blueish green. The flowers in their long tufts are supported upon slender foot stalks; and they are succeeded by numerous pods, with seeds like the smallest kinds of tares.

It is impossible but the farmer must have observed so beautiful a plant as this in the hedges; and he might have seen, wherever it is, that the horses and cows tear the fences to pieces to come at it; dragging out its long stalks, and eating them with a voluptuous appetite. This might have told him the value of the plant: for nature, their guide, never errs; and whatever they are particularly fond of, is always wholesome for them. But though hedges be the natural place of growth of this herb, it will succeed very well among the grass in pastures; and as it there does not spend itself so much in an upright long stalk, there is the greater quantity of leaves and young branches.

The soil in which it will thrive best is a tender loam; and where there is a piece of ground that has a good depth of this earth, and some moisture, it will be easy for the farmer to increase its value one third, without any additional expence, only by sowing this plant.

Let him order a quantity of it when the pod is near ripe to be gathered in the hedges; and getting out the seed, as we directed in the last article, let it be sowed among the grass in the same manner: giving it a covering of some common manure. Pond mud is the best of all.

The next spring many plants will appear; and from that time the quantity of it will increase in the grass. For the roots are perennial, and there will rise new plants continually from the seeds of such of the old ones, as have chanced to ripen. The cattle of all kinds will like the pasture the more for this, and thrive the better in it; and the hay will have the same advantage as the fresh grass: it will be more agreeable to them, and more heartening.

The farmer should understand the qualities of all those herbs which mix themselves naturally, or may be mixed by art among the pasture; for there are some very hurtful, as well as others of excellent utility. We are speaking here of those he should favour in their growth, and we shall direct him which he should destroy. At present his knowledge is so limited, that in general he considers every thing he does not sow, as a weed; and he thinks all weeds must be hurtful. Thus under the notion of clearing a pasture ground from weeds, I have seen this plant and the following, as well as that last described, pulled up under this denomination, in common with fern and thistles, though it would have been worth the farmer's while to have brought it into his ground at some expence. Our own country affords many plants equally valuable with those we raise from foreign seeds, and they may be introduced with much less trouble. We shall propose them here; and the farmer may be assured no one will be recommended to him, but what is certain of success from more than one trial, and more than our authority. The correspondences with which we have been favoured in Denmark and Norway, particularly that of the late great and excellent bishop of Pantoppidan, have furnished many observations on this subject; and still more are owing to that great light of the present age, Linnæus; whose talents in the knowledge of plants obtained him the favour of his sovereign, and whose whole study has been since to serve his country. He travelled for this purpose through all the northern provinces, and acquainted the farmers of one part, with what he learned from those of another: and his pupils tread in his steps to this day. Himself has published an account of the plants eatable by cattle; and one of his scholars, of the several uses to which the native herbs of that part of the world may be made subservient in common life. From these and the like works, and from the writings of our several correspondents, we have selected all that appeared useful to the English farmer, and have here given, and shall give the results of all the experiments they have made to confirm them; together with what has been done farther in this way at home. The plants of Norway, Denmark, and Sweden, are the same with those of England, with a very few exceptions: the farmer has the opportunity of seeing the uses that have been made of them, and we hope he will attempt so cheap and easy improvements, as those we recommend from their practice, and from our own observations.

#### CHAP. CVI.

##### *Of the sea pea.*

**T**HE farmer who is accustomed to the cultivation of the annual pulse, such as peas, tares, vetchings, and chiches, will be surprized to hear us speak of perennial rooted plants of the same kind: but he may be assured, there is no error in this; and we are about to add to the number,



an absolute pea, which produces fair and eatable pease in pods not unlike the common, yet does not perish as that after they are ripened, but has a root that lives many years.

This plant is like the common field pea, but more robust. The leaves have more numerous parts, and the stalk is angulated; the flowers and pods also resemble those of the common kind; but the pease are smaller, darker coloured, and bitterish.

Famine taught the people of Suffolk once to eat them; and they thought heaven had sent them that year. But though they are not to be commended for our tables, they are excellent for feeding hogs; and they will grow upon the sea beach where nothing else can. This is a good cause for their culture in such places; but there is one reason we particularly mention them again, which is, that a great part of their value depends upon a particular time of eating them. If they be suffered to stand till the pease are ripe in the pods, they shrink up, and grow hard, small, wrinkled and bitter: on the contrary, if they be cut as soon as they are grown to their full bigness, without standing to harden, they swell out before they dry, and they contain a great deal more meal, and that better tasted.

#### C H A P. CVII.

##### *Of birds foot trefoil.*

**T**HIS is a plant that mixes itself with the grass in many of the farmers grounds, without his care or trouble, and never fails greatly to improve them. It is in his power to introduce it universally. There are no soils on which it will not grow, and there is none whereon it will not make a great improvement.

The plant is so common, that it cannot but be easily known. It is not above six or seven inches in height. The stalks are numerous, and they are thick set with leaves, every cluster of which consists of five; two of these stand close to the stalk, and the other three in the manner of the trefoils, at some distance. The flowers grow in tufts at the top of the stalks and branches; and they are yellow. The shape is that of the pea flower, but small. The pods which follow these are strait and hard; and they spread from the top of the stalks in the same manner as the flowers. They have been supposed to represent the foot of a bird. The seeds are large and brown.

The plant is common enough, and its seed very easily procured. Let a quantity of it be pulled up when the pods are ripening, and thrown together in a barn, and when they are well dried, let the seed be thrashed out.

The best way of sowing it is what we have named for the others, to scatter it over the ground among the grass, at a time when the cattle are about to be turned into another pasture, and to spread over it a light covering of pond mud, or other appropriated manure. The ground will be gilded with the flowers the succeeding season; and the plant will afterwards take care of itself. This pasture will be found at once more acceptable to oxen, cows, and sheep, than others, where there is none of the plant here described; and by observation afterwards, it will be found to agree with them as eminently in regard to their flesh, as it is pleasing to their palate.

#### C H A P. CVIII.

##### *Of melilot.*

**T**HE husbandman has been accustomed to hear of melilot as an herb for plaisters, and he knows no more of it; but we are to recommend it to him on another score; its excellence as a food for cattle. It is a kind of trefoil; but more excellent than many which are distinguished for their use in feeding; it is as easily propagated as common clover; and it will grow any where. These qualities should recommend it in many places, where there are poor pastures that would be immediately made rich by sowing it.

It is a common wild plant in most parts of England, in hedges and among thickets, and there the husbandman must get it for seed. It used to be cultivated in the gardens where medicinal plants are raised; but since the ill behaviour of the apothecaries, who used to make the plaister green with verdegrease, has occasioned the plant being left out, that it may not be green, the gardeners have thrown it out of their ground: it is however common enough in many parts of the kingdom, and the seed may be easily obtained from the wild plants.

It is two foot and a half high. The stalk is a pale green, and sends out many branches: the leaves stand three on every foot stalk, as in the trefoils, and they are long and

narrow. The insect kind are so fond of the plant; that the leaves are usually gnawed to pieces all along the edges; and this is so universal, that it may be added to the farmers rules for knowing it. The flowers are small and yellow, and are in form like those of the other trefoils; but they are much more numerous. They hang in long clusters, and make a singular appearance. The seed vessels are a kind of pods, short and rough; and the seed is moderately large.

It is very easy to pull up a number of these plants toward autumn, when the seed is full grown in the pods; and they should then be used exactly, as the several other kinds we have named before. Late in autumn is the best time to sow them, and they will succeed very well if sprinkled pretty thick over the ground among the grass. Horses, sheep and oxen are all fond of the plant; and the effect it has in feeding, is equal to that of any of the foreign grasses.

One caution it will be proper to give the farmer: that he does not turn milch cows into these pastures, for this is one of the herbs which communicate their taste to the milk.

The husbandman is content to see his grass grounds over-run with mischievous plants; particularly the crow foot kinds, which are often as thick as if they had been planted there; but he takes no notice of these useful herbs, which will grow as freely, and which he may sow in those grounds without expence. The more of these improving herbs there are among the grass, the less room there will be for others which are useless or hurtful. This should be a great consideration in the time of laying down grounds for grass that had been in tillage: it is in this case in the farmer's choice whether he will mix these useful herbs among the grass, or leave the winds to scatter in the seeds of hurtful ones. There is no other chance; for grass never grows pure: and it certainly is worth his while to regard this article. There is no time so favourable for sowing them. For though they will make their way by degrees among established grass, yet they will succeed much better, when they are thus made to rise originally with it.

The farmer knows the advantage of clover sown among his ray grass. These are all improvements of a like kind, and many of them better.

#### C H A P. CIX.

##### *Of yellow medick.*

**T**HIS is an excellent trefoil, with a lasting root; and would succeed very happily either as a mixture among the natural grass of meadows, or in tillage land, under the same management with the artificial grasses.

We have it wild in England, but it is only in some particular places; and the plant is not sufficiently known. It is a robust herb a foot or more in height, and divided into many branches: the leaves stand in threes, in the manner of those of the other trefoils, and they are broad and oblong. The flowers are yellow, and they are shaped like those of the trefoils. They stand in longish clusters, in a kind of close spikes. The seed vessels are a sort of flat wreathed pods; and in these are small brown seeds.

We have the plant in many parts of Buckinghamshire and Hertfordshire, and in other places. It grows about the edges of hilly pastures, and sometimes in corn fields; often also among thickets and hedges. The plant should be cut when the seeds are full grown, and laid to dry; after this the seeds should be thrashed out, and sown, with the advantages we lately named, particularly when a piece of corn land is to be laid down for grass. The situation in which nature shews the plant, should also be regarded; and the places where it is added to the natural grass by art, should be large closes that lie high, for it will not succeed in small enclosures, that are down in bottoms.

If there be not opportunity for this, let the seeds be sown as we have directed for the others in autumn, over a field of natural grass. The benefit of this plant in the northern parts of Sweden is so great, that the farmers esteem it the very best of all their feeding herbs. There is no reason those of England should not have its full benefit, since it is native of the country: and there is a double advantage in those plants, which will succeed either alone, or with the natural grass, because they may be used on so many occasions. The Swedes are confident this plant encreases the quantity of milk, and also enriches it; when their cows feed in pastures where it is abundant. This is an article of great consideration, because many of those plants which encrease the quantity of milk, impoverish it at the same time.

#### C H A P.



## C H A P. CX.

*Of melilot hop-trefoil.*

WE have just recommended *melilot* itself for an excellent feeding herb; and in the preceding volumes we have named the *hop-trefoil*. The farmer is to understand, that we are not repeating in this place what we had said in either of those; or treating of the same plant. This peculiar kind of trefoil, which from its mixed appearance some of the authors who have written of plants, have referred to the *melilot* kind, and some to the *hop-trefoil*, is truly of a middle nature between both, and not improbably is one of those which are supposed to have originally risen from the mixture of the plants, as the *melilot* and *hop-trefoil*. But it may serve to set aside that error. The horse and ass form together a mule, but the mule cannot propagate its species. So the speedwell and vervain, in the Upsal garden, have formed a mongrel plant, but it ripens no seeds that will grow. This plant has a great resemblance to both those from which it is named, though it sufficiently differs in several other respects from either: but it produces seeds in abundance which propagate it, and therefore it has not been so produced. This is plain in the present instance; and therefore we may reasonably believe, that all the other plants, supposed to have been raised by a mixture of two kinds, and which we find permanent, have been erroneously ascribed to that production. Here and there an instance may happen of a third plant, produced from the *farina* of one species falling on the *stigma* of another; but it must be very rare; because the globules of *farina* are not likely to suit any *stigma* but that of the plant to which they belong: and when it happens, it goes no farther, the new plant not being able to ripen perfect seeds.

This point we thought needful once to set right to the farmer, because the doctrine is now asserted by some very warmly, and because it would lead him again toward an error, from which some have been difficultly recovered, that of believing the possibility of a change of species: for this would come toward the same mark. He may be assured things are as they were from the beginning; and will continue so to the end of the world: and that this plant which has a resemblance in part of the *hop-trefoil*, and in part of *melilot*, is yet a distinct and original species; and is as different from both of them, as they are from one another.

This plant is upright but weak, and is about ten inches high. The stalk is square, and of a pale green. The leaves stand three on each foot stalk, and they are small, broad, and of a stronger green than the stalk. The flowers grow in little tufts of an oblong form, and they are small, and of a gold yellow. The seed vessels are numerous, and stand in an oblong head.

It is a native of our pastures in some places, and may with great advantage be brought into the same use in others. We have accounts from Denmark, and also from Sweden, of the great benefit the cattle find by feeding on it; and the seed is so abundant, and so easily collected, that we cannot but recommend it earnestly to the farmer here.

It is not of the nature of those which can be raised alone for artificial grasses in a lasting tillage; for it is only a biennial, but it grows as freely in fields where there is grass, as where there is none; and in poor pastures, on a dry soil better than any other.

The husbandman often has dry, gravelly, or sandy pasture ground on a hill, at a distance from his farm; which produces very little, and which it would be very expensive to manure: besides that the benefit, even of the best dressings, would not be lasting; because they would be washed off by the rains from the nature of the ground. It's there he may best improve by the addition of this plant. Let him employ a labourer to pull up a large quantity of it where it grows wild in abundance; and the seeds being shook out as soon as the plant is well dried, let him leave them about a week to harden on a floor; and then sow them in such a field, scattering them thick among the grass.

I have had opportunities of making but very slight trials of these things; but so far as I have, they have succeeded. Four or five years since, I scattered a handful of the seeds of this plant, upon a piece of a poor lilly pasture, where the yellow sand of the soil was seen among the thin blades of grass, and in the very next year it covered that part; and has now overspread the whole inclosure with an abundance of the most healthy food. Horses, oxen, and sheep, all feed upon it with great satisfaction, and we see the good effects in their condition.

## C H A P. CXI.

*Of water horsetail.*

THE farmer is accustomed to consider all the plants of the horsetail kind as incumbrances upon his land, and weeds of the worst sort. In general they are so, but the kind, properly called water horsetail, is an exception. It affords a large quantity of excellent food for cattle; and cows are remarkably fond of it, and their milk is increased and improved by it. Let the farmer rightly know this from the others, that he may encourage its growth while he uses his utmost endeavours to prevent theirs.

It is very tall and robust: the stalk is pale, hollow and jointed; and the leaves, if they may be called such, are very long and of a fresh green. They grow round the stalk at the joints, like rays of a star, and are very long and slender. It grows only in wet marshy places.

By these characters the husbandman will know the plant. We are not about to advise him to cultivate it; but to spare it where nature has chanced to throw it in his way. It will generally be found, without his care, in places that are fit for it; and will spread over them, and sufficiently occupy them if he leaves it unmolested.

There is another kind with long leaves, which he should destroy as carefully as he propagates this; it is called corn horsetail, but is not peculiar to corn fields. It is smaller and more branched than this; and when eaten by ewes with lamb, it occasions their casting them.

## C H A P. CXII.

*Of plants the farmer should destroy.*

WE have given a considerable detail of those plants, which the husbandman will find it proper to cultivate, tho' they are hitherto unknown in his profession. We shall add here a list of plants which are hurtful to him, though he is not aware of it; and which it will be of use to him to destroy. The wild herbs of England are not sufficiently understood, either with regard to their use or danger: we shall be happy, if so much concerning them may be turned to use as has come within our knowledge. Those which are commonly known to be hurtful, we have spoken of in the preceding volumes. These are such as have before been overlooked or unsuspected.

1. BUTTER-WORT: A small herb which grows on bogs and marshy grounds, with fatty leaves, and a flower not unlike a violet. This is a plant sheep are fond of; but it is destructive to them. It throws them into the most dangerous purgings, attended often with feverishness; and sometimes into the rot. It is not universal throughout the kingdom in those kinds of ground; but the farmer should every where be upon his guard against it, for a very small quantity of it will do him a great deal of damage. He cannot miss knowing it after the short description we have given; for it is one of the most singular plants in the world. The leaves are fatty, and often purplish. The stalks are naked, slender, and not above three inches high; and that the top of each is one flower with a spur behind. This is commonly blue; but the plant is sometimes smaller than usual, and the flower is reddish: This is as hurtful as the other.

2. WATER-SCORPION-GRASS. This is a very beautiful water weed; but as pernicious as the former. It grows always by the sides of rivers, ponds, or ditches; and is never found elsewhere. It is about ten inches high: the leaves are oblong and of a pale green; the flowers are of a beautiful blue, and they stand in long spikes, which turn back at their ends, in the manner of a scorpion's tail when it is rolled up. The plant had its name from this. The flowers are so pretty, that the plant can never be overlooked; nor should it even be suffered to grow where sheep come. These creatures seem to be less under the guidance of instinct than any other; they eat greedily of several plants which are very hurtful to them. This brings on desperate disorders; and, in the end, the rot; which is more difficult of cure when brought on by these plants, than any other way.

3. LONGLEAV'D WATER-HEMLOCK. There are several plants, of the name hemlock, of fatal qualities; but none more than this, though it has passed unsuspected by some; and has even been spoken of as harmless, in regard to cattle by others. These are the cases in which the husbandman must be most of all at a loss; and nothing can be more useful than to set him right.

It is a tall and stately plant; the stalk is four or five foot high, and divided into many branches. The leaves are large and spreading; but they are cut and divided by threes into many parts, and their colour is a deep green. The



flowers are white, and they stand in great round clusters at the tops of the branches. The plant never grows any where but by the sides of waters, principally near great ponds. The farmer will know it by this description; and he should destroy it wheresoever he finds it. Cattle, which have been always kept in the places where it grows, will not meddle with it; but those brought in from other grounds, are often destroyed by it.

Wepfer, a celebrated author, wrote an entire treatise upon its poisonous effects on our own species; and with great truth, for many have perished by eating its roots. But Rivinus, a writer of no less established reputation, has asserted since, that oxen were very fond of the plant; and eat it without mischief.

An accident has also taught us since that time, that the plant is as fatal to those creatures, as to ourselves. In the spring of the year 1744, a quantity of the roots of it were thrown upon the shore in some part of Sweden, where there were three oxen under the care of a keeper: they eat ravenously of the roots, and they all died. The keeper of the oxen gave an account of the accident, and of the occasion. Some of the roots were sent to the royal garden at Upsal; and being planted and well watered, this herb rose from them. The fact is given, with all its circumstances, by the celebrated professor of the Upsal garden; and there can no longer be any doubt, but the plant is universally poisonous.

4. LANCASHIRE ASPHODEL. The farmer is not to suppose that, because this plant is named from a particular country, it is found no where else. We have it in marshy places about London, and in many other parts of England; though as it rarely flowers in this part of the kingdom, and its leaves are like some of the flags, it is not often observed.

The root creeps under the surface: the leaves are long and moderately broad, and they are of a pale green colour. They very much resemble those of the common yellow water flag, but that they are not so large. This is usually the whole appearance of the plant in this part of the kingdom. When it rises to flower, the stalk is round, of a pale green, and in part covered with leaves of the same kind with those from the root. They grow singly, one above another; the flowers stand in a loose spike, and are of a fine yellow; they are sweet scented, and they have a peculiar aspect; for the filaments are woolly.

Wherever the farmer finds this plant, he should destroy it. He may suspect that it is in his pastures when he finds his sheep sickly, and he cannot tell why; and he should look for it in all marshy places, and near the sides of ponds: if he have it growing, the sheep will be frequently feeding upon it; and the certain consequence will be their falling into those disorders, which precede the rot; and finally into the rot itself.

5. HAIRY WOODGRASS. This is one of the most beautiful among the grass kinds, and one of the most singular. Indeed, its flowers and seed vessels shew it more properly to be of the rush kind; though the leaves are flat and grassy. It is frequent in woods and thickets; and it sometimes rises unsuspected among the grass of hilly pastures. We neither observe the plant nor know its danger; but the Swedes, who are more attentive, not only to the mischiefs which happen to their flocks, but to what causes them, have discovered this grass, though it somewhat alters its form, in their pastures; and have found that it brings on disorders in their sheep.

In the common state wherein it is seen in woods, it grows to a foot and half high. The stalk is slender and jointed; the leaves are grassy, but they are broad and hairy; and the seed vessels, which are blackish, hang by slender footstalks like threads.

In pastures it grows to a less height, and the leaves are smooth: the seed vessels also are purplish; but in all other respects, the plant is the same.

It is easily known when in flower, and even when not; the hairy leaves discover it in its more usual places of growth. The farmer should take the trouble of pulling it up wherever he sees it; and he should sow better grasses, or some of those useful plants, we have named, in its place. This is the great precaution against its return, for it will not grow where there is plenty of other herbage.

6. DROP-WORT. The name drop-wort is given to many plants, and very unhappily, to some that are poisonous, and others which are innocent. The plant we mean, in this place, is that which the Latins call *filipendula*. The farmer will know it by this description. The stalk is two foot high, and usually reddish. The leaves are very elegantly divided into numerous small parts, and are of a fine green; and the flowers, which are snow white, grow in

great clusters at the tops of the branches. The root is composed of a multitude of large knobs fastened one to another by slender fibres; and they spread a great way under the ground.

This plant it is the interest of the farmer to destroy, whensoever he meets with it in his ground, not that it is hurtful; but it will occasion him much mischief. The roots are the greatest delicacy the hogs know; and those creatures, who smell them at a considerable distance, even as they lie in the ground, will break through almost any fences to get at them, and will tear up the ground for a vast way to find them.

7. CLOWNS ALLHEAL. This is a plant no other way hurtful than the preceding: but so much mischief is done the same way to get at it, that a wise farmer will never suffer it in his grounds.

It is two foot high, and has somewhat of the appearance of the dead nettle kind, but the leaves are longer. The stalk is square, and somewhat hairy; the leaves stand in pairs, and they are notched at the edges, and of a dusky green: the flowers grow round the stalks at the joints, six at each joint; from the middle of the plant to the top: they are small and red, with some mixture of white, not unlike the flowers of the hedge nettle. The roots are knobbed and fleshy. The whole plant has a disagreeable smell to us, but the senses of various animals differ. Cats are ravished with valerian; and there are caterpillars which feed on spurge. The hogs are so fond of this root, that they will break any fence, except a wall, to get into the ground; and they will tear up a vast space of the turf wherever it grows. For this reason it should always be destroyed.

Its most natural place of growth is by the sides of ponds and ditches; but where the adjoining fields are wet, it will spread all over them.

It would be wrong to mention the disadvantages arising from this plant, without naming also its virtue: it is a balsamick, and healer of fresh wounds. Old Gerard tells, that a country fellow desperately cut with a scythe, refused his assistance; telling him, he knew better than he did what would cure him. It was this plant he applied. Gerard acknowledges its virtue; and thence, and from the surly speech by which he was led to the knowledge of it, he calls it *clowns allheal*, a name copied by all others.

8. WHITE WOOD-ANEMONE. This is a very early beauty in our pastures, where there are woods and thickets near; but its elegance should not plead against its destruction, for it is a very mischievous plant.

It is properly an anemone, though a weed in England; and in gardens it becomes double, and makes a very agreeable appearance. The leaves are of a fine deep green, and they stand upon slender green or reddish footstalks. Each is divided into three principal parts, and the smaller divisions are also cut or jagged at the edges. The stalks which bear the flowers have three of these leaves of the same form and colour, and running up naked two inches above these, they bear each one large and elegant flower. This is naturally white, but it has often more or less of a very agreeable purple tinge. The seeds follow naked in a cluster.

The natural place of growth of this plant is in woods; but it will sometimes rise under shady hedges, and the spreading roots will soon carry it from them into the fields themselves, where it is eaten by cattle early in spring, to their great hurt, and often to their absolute destruction.

The leaves of this plant appear in all their freshness very early in spring, when little else is up beside the grass; and it is at this season principally oxen and cows feed upon them: for when the flowers appear they will not touch them: whether it be that they then know the plant, or what is much more likely, that the leaves have no longer their fresh and juicy texture, the nourishment being sent to the stalk.

The consequence of cattle eating but a little of this, is their falling into a strangury, or difficulty of urine; and if they eat more, they make bloody water, and often die. What is to be done in these cases, we have said at large in the preceding volumes, treating of the disorders of cattle: but the best remedy is prevention. The farmer should destroy the plant wheresoever he sees it; and this is the easier, because it seldom spreads all over the ground, but keeps in some one spot, where the roots may be dug up.

9. THE THICK POROUS MUSHROOM. This is a vast fungus; of the kind of those we usually call toad-stools, by way of distinction from the fine well-tasted kinds which come to our tables. It is a custom to rank all those as poisonous, which are not pleasant to the taste, but that is idle and erroneous: there are many which are not pleasant, and yet are wholesome; though there are some really and truly poisonous. This of which we speak in the present place,



is a coarse and very ill-favoured kind, but it is not unwholesome. The palates of cattle differ from ours; and we find that cows think this a very relishing morsel, but it hurts their milk, and the farmer should for that reason destroy it; nor is any thing more easy, for it is very conspicuous, and very easily distinguished.

It is a large mushroom, four inches and a half high, and four inches in measure over the head; the stalk is very thick and spongy. The head is broad and thick, and is of a dull yellowish brown on the upper side. Underneath it is of a greenish white; and it is not divided into galls, but of a fleshy substance, and full of pores, or irregular holes.

It is common in woods and coppices, and sometimes rises under hedges in the pasture grounds. The cows think it a delicacy, and never fail to eat it wheresoever they find it, but it always gives a nauseous taste to their milk; and when the quantity is great, makes the cream ropy and thick. It is principally in August and September that it is found; and the hedges where it is most likely to grow, are those which have old trees in them; the farmer should in these cases send out a labourer for half an hour, early in a morning, with a hedge stake in his hand, to beat them down and destroy them. There is danger in letting them stand, not only because of the cattle finding them, but because they ripen their seeds in great abundance in the holes of the under part of the head, and these produce young plants abundantly.

The farmer is apt to find fault with many herbs as hurting his butter, which have nothing to do with it, particularly the marsh marygold, which no cow eats; but this unsuspected mushroom is really hurtful. I have known them very carefully send labourers, in the beginning of May, to tear up the water marygold in their meadows; from an opinion, that it was the flowers of this plant which gave a yellowness to the milk; but a very little observation would have taught them better, for cows never meddle with the plant. Wherever they leave it flowering, they will find it stand untouched till it decays.

It may not be amiss to remind the good housewife on this occasion, that the plant is harmless, and that its large seeds for flowering before they open, being preserved in vinegar in the manner of capers, make an excellent pickle, very like that, only better.

#### CHAP. CXIII.

##### *Of motherwort.*

**T**HIS is an herb the farmer need seldom give himself the trouble to cultivate, for its natural place of growth is about his yard; but where he has it not naturally, he will do well to sow a little. It is not a food for cattle, but a medicine.

The farmers of old time esteemed it greatly, when their horned cattle had diseases of the throat, the breast, or lungs; and there are recorded instances of many ages standing, that it has done great cures even in the murrain. One instance we have received of later date, and upon very good authority. A farmer of Cornwall, supposing the disease which has been so fatal among the horned cattle was breaking out among his little stock, had recourse to this herb, and drenched them all. He bruised a large quantity of the plant, and pressing out the juice with a little strong beer, gave half a pint for a dose to every one of his cattle morning and evening. He seems certain that three of them had the first symptoms of the disease, when he undertook their preservation by this means; and if he did not deceive himself in that particular, the power of this medicine must be very great, for not one of all his cattle died.

The wholesome nature of the herb all physicians know; and it is plain they had a great opinion of its virtues, who gave it the Latin name, which is *cardiaca*, a medicine for the heart. It is certainly worth farther trial: nor is there any thing the husbandman ought to seek so carefully, as a remedy for this deplorable disease.

Motherwort is a rough and ill-looking plant, of a yard high. The stalks are square; the leaves are deeply jagged, and of a blackish green; and the flowers are small and reddish: they are somewhat like the dead nettle flowers in shape, but smaller. It will grow on any waste ground without culture; and if once sown, will perpetuate itself for ever.

#### CHAP. CXIV.

##### *Of the French management of lucern.*

**T**HE culture of lucern we have given in the preceding volumes; and the advantages of introducing it into the course of the husbandman's business are so great, that none

who has opportunity should neglect it. Since the time of that publication, a method has been found of adding greatly not only to the annual produce, but to the continuance of this plant in the ground; and sufficient trials have been made in England, to ascertain the truth of the improvement.

The world owes the thought to that excellent naturalist Monsieur Du HAMEL, who introduced the horsehoeing husbandry into France, at a time when ourselves neglected it, though proposed by Mr. Tull in our own country, having seen from experience whatever its real merit, and what its defects has now reduced to an art of absolute certainty: and having the happiness and honour of that great function, the protection of his sovereign, he is daily adding wealth as well as knowledge to his country.

This gentleman observed, that lucern, when it had grown some years upon any piece of ground, grew weaker than at first, and its produce became gradually not only worse, but less in quantity. Grass grew upon the intermediate ground, and the proper crop appeared overgrown and too old for service.

On opening the ground about several of the plants in searching the cause of this, he found the principal roots had penetrated through the whole coat of useful mould, and were lodged in a cold clay, or some other bed of earth, useless to vegetation.

This was a plain cause, and this he undertook to remedy in the following manner.

He sowed lucern in the usual way; and when the plants had got some height and strength, he took them all up, and transplanted them, cutting off the principal roots which run downwards. This was introducing garden culture into the field, but for a crop which is to stand so long, it will be very well worth his while.

The best season for this transplantation is autumn; and showery weather should be chose for doing it. The ground, into which the plants are to be removed, should be got quite ready for them; and then no more should be taken up than can be very well managed in the new plantations, for the side fibres soon get dry, and are hurt by lying in the air; and it is on these the great dependance is placed for the succeeding crop. The long downright roots being cut away, the others are to be trimmed at the ends, and the plants reduced to a small quantity at the head. This done, they are to be regularly planted at the distances we have before directed, treating of this plant. Every one knows showers are needful upon this occasion; and if nature does not send them, the labour of the hand must supply their place. No plant is better able to take care of itself than lucern, when it is once properly established; but this is a peculiar time, and is indeed a process of art, and therefore out of the way of nature: it must be supported as it was begun; and if no rains fall, the whole plantation must be well watered once, twice, or even three times, at one day's distance: more than this will never be necessary, often less; and as we have directed a showery season to be chosen, most probably nothing of it will be required; but nature will do all.

From this time the plants are to be treated in the same way as others, of the same kind and growth. We have given directions for this, and need not repeat them here.

The consequence of this method of plantation is, that the principal downright roots being destroyed, the side fibres enlarge and encrease in number: they spread themselves throughout that part of the ground, which affords the natural nourishment for plants, and consequently the crop is well supplied; whereas, when the strength of nature at the root was suffered to waste itself in the downright shoot, fewer fibres were produced where the nourishment lay; and the root was sent down to a part of the earth, where there was none. Thus the plant itself was ill supplied, and the whole space of the ground, intended for giving it nourishment, was given to useless weeds. Grass grew upon it, and that appeared to starve the crop, while in reality the cause lay much deeper.

Reason declares plainly for this practice, and experience in France countenances it entirely. In England we are not without the same authority. A clergyman, who has an estate in Cornwall, and who is employing a great understanding in this noble and most worthy pursuit, the improvement of agriculture, assured me, that by this practice, he had raised a field of lucern, which was so strong this present year, that, about the middle of July, when he was pleased to speak with me about it, his people had cut three crops; and he made no question of having two more very good ones during the course of the summer.

The farmer is often misled by the romantick accounts of those, who are desirous to recommend particular practices; but we have told him he may depend on meeting TRUTH in



in this work. He will certainly see, that a plant, from which he may obtain five crops of hay in a summer, and which will serve him a great part of the rest of the year for seedling, is worth his regard; and this method of improving it to the utmost value, is worth his trying.

The practice, though it has been applied by its inventor, only to the lucern, may be used with the same propriety to all the perennial deep-rooting plants; for they all lose their great fertility, when they descend into a poor, cold, or useless stratum; and frequently, the decay of the crop is owing to this, when it is attributed to a very different cause. It may be useful to know this, if it were only to prevent the attempting a remedy by means that cannot succeed; but when we see it in the full light of the advantages of transplantation, it is worth all our care; for this way the mischief may be entirely prevented, and it may be applicable, not only to many of the lasting crops now in use, but to such also as may be introduced hereafter.

The system of field and garden culture are, in reality, the same; for vegetation is managed upon the same principles, whether the extent of ground be less or greater; and gardeners know the use of this practice very well, both in regard to herbaceous plants, and trees. They frequently transplant the one kind for the sake of cutting of the top roots, and they lay a tile at a small distance under the ground in planting the other, to make the roots spread at a small depth, by preventing them from penetrating farther downwards. By all that I have seen in gardening and in farming, not only in the large way, but by experiments made purposely for that end, I think that the great advantage to plants in general is, the promoting a large spreading of side fibres from the root, and keeping these within a certain depth: for the earth, which is within the influence of the sun, and is capable of being moistened by every shower, is the part which gives, and must give nourishment to plants. We have lately found, that half the trees, which miscarry soon after planting, owe that accident to their being planted too deep: we see shallow soils, where the bottom is any thing but clay, succeed very happily for almost all crops; and we have a most remarkable instance in the culture of the vine, that the spreading of the roots within the influence of the sun, is the great secret for ripening the fruit, and perfecting the juices.

All this considered together, gives a very striking lesson to the farmer, that by whatever means he can give this advantage to the crop, he ought to do it.

#### C H A P. CXV.

##### *Of bees.*

TO what we have published relating to bees, in the preceding volumes, and which we hope contains all that is useful in the common practice: we have now something to add from the correspondence of an ingenious clergyman in Suffex, who has bestowed a great deal of his leisure upon the care of this useful insect, and who, adding to the common advantages of observation and accustomed knowledge under this head, a very perfect classical learning, has endeavoured to improve the common practice of England and Holland, from that of the ancient Italy; and has added to Virgil, Varro, and Columella, as well as to the moderns, a great deal from his own observation. I wish he had permitted us to publish his several letters in his own words; but since that is not allowed, we shall be careful to preserve their meaning; and shall endeavour to render the instruction they convey plainer to the farmer, and in a shorter compass.

This gentleman's house is situated upon the edge of a vast heath: before it there is a large fertile space of ground, well enclosed and cultivated. Behind he is sheltered from the north by hills. Plantations, made a century ago, defend him from the east; and even the heath, to which he is open to the south west, is not without some shelter from stubbed oaks and brambles on the rising hillocks.

Among the other amusements of a retired life, the care of bees came early into this gentleman's thoughts; and he saw that his situation favoured them, because it was warm and well sheltered: but he found advantages in it, which exceeded expectation; and of which, at first, he could not guess the cause.

Virgil, from whom many of the other Romans copy their directions, advises the placing bees where they will be most quiet; and where the sun has power. This gentleman chose a situation, the warmest and most sheltered of any about his house, and where the servants had least occasion to come. He took into his own hands, the two or three pasture grounds which lay contiguous to his house, and keeping them principally for hay, few cattle were put into them.

The creatures therefore had rest and warmth; and he assisted them with all the comforts usually directed in books, or practised by those who keep bees. He observed, that they thrived better than those of his neighbours, and upon examining into the reason, he soon discovered that it was owing to their having larger room to rove: those bees, which belonged to a neighbour, whose house was near a publick road, and whose hives stood near his yard, he found scarce ever ventured farther than the garden, wherein the hives were placed: whereas, his went freely over all the fields, especially when they were laid up for hay; and what surprised him very much, they took the heath into their circuit, and seemed no where happier.

The success of his swarms, justified the doctrine of the antients on this head; and he soon found the means to encrease them yet more. It is a custom to rub the hives with baum, an herb very agreeable to the bees. This gentleman found they were much sonder of another herb, the CEDRONILLA. The reader will find a full account of it in our body of gardening, with a figure, and its culture. It is a species of dracocyphalus; and the vulgar gardeners call it, from some resemblance in the smell to the balsam of Gilead, the balm of Gilead plant. The hives of the bees were rubbed often with this; and half a dozen flourishing plants of it were set round about the hives, and kept well watered. This had a great effect. The bees were always lively and cheerful, and they soon became so numerous, as to form swarm after swarm, and require new habitations.

It often happens that late swarms are useless; but no such accident happened to this gentleman.

They found food in plenty, whatever were their numbers; and as they stood warm, they would venture out in search of it oftener than others would in suspicious weather.

The quantity of honey from these bees was greatly superior to the usual proportion, but there was a particularity in the colour: it had a pale reddish cast, but no other flavour than the honey of other people.

The proprietor of the hives had often wondered at the frequent visits his bees made to the heath, but he began now to suspect the cause.

He observed, that they were very fond of the flowers of the plant called HEATH, which grows in abundance on the grounds of the same name; and as the colour of that flower is red, he began to suspect this gave the tinge to the honey. The observations and enquiries he made in the succeeding seasons, gave him full proof of this. He found that all those who kept bees near the heath, had more or less of reddish tinge in their honey. In some who lay very near, but with a road between, the honey had little of that cast, because the bees would not venture among the cattle and the passengers; in others who had the passage free, it was more: and he found one farmer, whose little garden terminated at the heath, and whose house had its front upon the road, whose honey was so red, that none chose to buy it.

But with this there came also another discovery of more consequence, the redder the honey was, the greater was the quantity of it; and as this tinge does no real hurt to the honey, it is certainly of consequence that the quantity is so much encreased. The observation is certain, that bees will feed with great pleasure upon the flowers of heath; that they get a great quantity of honey from them, and that the honey is as good as any other, the colour of it being somewhat particular. This should teach all who live on the borders of heaths, to keep abundance of bees: for they will be supported in such places with less expence and trouble than elsewhere, and they will produce a much larger profit.

The nearer a stand of bees is to a kitchen garden the better, not only for the health of the bees, but the flavour of the honey. The warmer parts of Europe abound with the fragrant and aromattick herbs wild; and it is for that reason the honey of those places is superior to that of England. The only chance we have of giving ours the same quality, is by planting such herbs near the hives. In a kitchen garden they are raised for the service of the table, and the bees will have their share of them. Thyme and savoury, hyssop, and sweet marjoram, all give this fine flavour to the honey; and the greater the abundance of them, the better it will be.

This gentleman observed, that the bees were very fond of borage; and he sowed a large semicircular bed of it at a small distance from the hives. This agrees with the direction we have given in a preceding chapter, for raising the plant vipers buglofs for the same purpose; for this is not very unlike borage in its nature. Indeed I have observed, that all the asperi foliate plants, properly so called, such as buglofs,



sage of Jerusalem, and the like, are very much sought after by bees; and many of the stellate kind, as the white lady's bedstraw, and such others.

#### C H A P. CXVI.

##### *Of the use of the saffron plant for bees.*

THE antients give us one direction which we have not followed, and which I am particularly surprized should escape this gentleman; it is the planting saffron near the places where bees are kept. I have observed the common garden crocus, which are true kinds of saffron, are always greatly frequented by the bees during their short times of flowering; and it is not a wonder, for we find their wine parts, which in all flowers are the peculiar organs that furnish the honey, are very rich and moist. The antients say, the saffron gave not only a fine aromattick flavour to the honey of bees, which were kept near where it was planted, but also heightened its natural yellowish hue to the colour of pure gold. Columella recommends the Corycian and Sicilian saffron for this purpose; but our farmer may be told, there is none equal to that of England.

The common saffron may be very easily propagated in gardens for this purpose; and its flower is as beautiful as any of the common crocus we plant for shew. But much more than this may be done for this purpose. We have brought the art of gardening to so much perfection now, that we can continue a shew of flowers, in the plants of the bulbous kind, much longer than their natural time. This is to be done by planting some parcels of roots later in the ground; and by this art, with the assistance nature gives of the variety of spring crocus and autumnal ones, we may have a blow of these flowers, for the service of the bees, nearly all the summer.

Beside the first mentioned use of giving, by this means, a peculiar colour and flavour to the common honey, this plantation will very well answer the purpose of those, whose honey suffers in colour, from their hiving in the neighbourhoods of heaths: the bees, by having a quantity of crocusses just before them, will be kept, in some measure, from the flowers of the heath; and the yellow from these plants will take off the redness which arises from the other.

A farther direction may be given on this head, which will be of great advantage. The farmer, who lives in a saffron country, should always keep bees; they will be particularly strong and healthy from the advantage they receive from this plant; they will swarm oftener and in larger number than others; and not only the quantity of honey will be great, but the quality excellent.

There is more difference in honey, occasioned by this article of the plants in the neighbourhood of the hives, than many think. The gentleman, to whom we are obliged for the remarks, whereon these additions to that article are founded, assures us, he can discover by the taste of the honey, what plants principally grow in the neighbourhood of the place where it was made. The farmer, who plants saffron, should always place a number of hives in that part of his garden which is nearest the saffron field, or from whence the bees can make their way the most easily to it. Or if others in his neighbourhood have saffron fields, tho' not himself, he should never fail to take the same advantage. It gives him a considerable benefit without any hurt to the proprietor. The bees will give no disturbance to the people employed to gather the saffron, for they only work in the fields certain hours; and those creatures will not come into it at that time, because they hate a disturbance; they take their flights only when the gatherers have left the field, and they enrich their combs without hurting the saffron.

#### C H A P. CXVII.

##### *Of other herbs which give a flavour to honey.*

AMONG the flowers bees love most, come those of the bean, but they are least useful to them. The quantity of honey they obtain from these, appears, on nice examination, to be less than from many other flowers; and tho' the bean flower itself be very sweet, it gives a kind of faintness to the honey. Nothing but repeated and accurate trials, by tasting the honey made at certain seasons, can determine this point of the effect of various flowers upon it; but those trials are worth making; and the effect is easily known. This has been fairly tried by our correspondent, and he has found, that the honey they collect from these favourite blossoms, is pale, whitish, mealy and sickly to the taste.

On the contrary; where there are turnips and cabbages which stand for seed, the bees are fond of their flowers; and

though one would think these a very unpromising kind, they encrease and improve the honey. There is no purer honey than is collected from these flowers; its colour is a pale yellow, and the taste is a perfect simple sweetness. The first observation our correspondent made on this, was on the honey of some bees which stood near a field of corn which had been ill managed, and was over run with *charlock*, a plant of the same class. He observed the bees were particularly fond of the flowers of this plant, and he had the curiosity to desire to taste the honey. This gave the first intimation of the effect of that plant, which more particular observations afterwards confirmed.

Mathiolus, who has collected carefully from the antients on this head, mentions, with wonder, the fondness bees shew for the mustard plant: Virgil and Columella overlooked this among the favourites of the bee, but observation proves it to be true; and upon the principle just laid down, there is nothing strange in it, for the mustard is of the same kind with charlock, turneps and cabbage, though different in the peculiar sharpness of the seed: the flowers are formed alike, and they are of the same class of plants.

Violets are a flower very agreeable to bees, for the time they last; but let the farmer observe, that the common single violet, such as grows in hedges, is the proper kind; for the double violets, usually planted in gardens for ornament, while they invite the bees by their smell, only tantalize them, for they contain no honey. There is a very peculiar sweetness in the honey collected in this early season, at a place where the violets, whether wild or planted, are abundant.

In all these accounts of the effect of various plants on honey, the reader is to expect only moderate changes, and these, according to the circumstances, greater or lesser in degree. The honey never shews the full effect of any flower, because the bees never feed from any one kind alone; but from the garden plants in full flower, and which they are seen most attached to, some fair conclusion may be always made, that the honey of that time, though not collected entirely from these, yet is in great part owing to them.

There are also seasons when bees go less out than usual, or to a less distance. These shew the effect of certain plants more clearly, if there happen ten days or a fortnight of tempestuous weather; at a time when a parcel of seedling turneps are in flower in the same garden where the hive is, the bees will content themselves with what they can get from these, because it is disagreeable to them to go farther, and, in that case, the new made honey will, in a manner, be all made from that flower. These, and the like accidents, in the course of a life devoted to contemplation, have given opportunities of knowing the effect of particular flowers on the products of the bees, which have perhaps fallen in the way of few others.

Roses are a favourite flower of bees; but it is only under certain circumstances they pay so much regard to them. It is not honey, but wax they collect from this flower; and if they do not want wax, they slight it.

The red rose is the kind they most affect; and the less double it is, the better they like it. The reason is plain from what we have explained before, relating to the nature of wax. The yellow buttons, on the threads of flowers, are the parts wherein it is originally formed by nature, and from whence bees collect it. These are very numerous in the rose, therefore the bees love that flower; but the more double the flower is, the less wax there can be in it, for the leaves, which make this fulness, are formed out of the threads and these yellow buttons; so that the fuller or doubler the flower is, the fewer of these buttons there are, and the less temptation the bees have to meddle with it. When a rose is perfectly double, there are none of these threads or yellow buttons left in it; and the bee no longer regards it at all. This discovery, that the doubleness of flowers is formed in this manner, is new, but it is certain, and in many instances, particularly in the hollyhock and in the double tulip; the button may be yet seen upon the new leaves, shewing their origin. While these buttons remain in any state in the flower, the bees will come to it for this purpose; but they are fondest of it in perfect singleness, which is the state of nature, and in which the wax is found in it in the greatest perfection.

The common broom is another plant, from whose flowers the bees collect a great quantity of honey. This is suffered, by a strange neglect, to over-run whole tracts of hilly ground in some parts of the kingdom; and broom-fields is a term by which the people express such land. Though they are very negligent who suffer ground to be thus over-run, the farmer should take the advantage of it for his bees. If he live near such a field, let him immediately



ately set up a stand of hives in that part of his garden, from whence they can get at the broomfield with least trouble; where the course is shortest, and the way liable to least disturbance. His bees will soon find the way to it, and he will reap the benefit, in a great quantity of very fine honey, and an extremely thriving stock.

In the year 1752, our correspondent being on a journey thro' a great part of Kent, examined, in his curious way, the honey of several places where he had opportunities; and particularly that of two or three farmers, who had this peculiar advantage for their bees, of a broomfield in the neighbourhood. He found the honey very good in all these places; but much of the nature of that collected from turnep flowers, that is pure and excellent, but with no peculiar flavour.

In one farmer's house he found a honey thinner than the rest, but not subject to candy; the colour a clear and fine yellowish, but the taste highly aromack. Those who have been accustomed to the taste of the true foreign capillaire, will know what we mean by this; that syrup has it in perfection, and it is owing entirely to the honey, for the maiden hair, which is the only ingredient beside, has no such flavour. This taste in the foreign honey, we know, is owing to the aromack herbs, which are so abundant in those countries: our correspondent knew the broom flowers could not give it in this instance, and he examined the field to find some other cause. The ground was over-run with anthills; and there was in it an old gravel pit, long covered with weeds. All over these anthills, and upon the sides of the old pit, there grew a vast quantity of wild thyme, the most fragrant of all the English aromacks; from this the bees had collected enough to give fragrance to the abundance of pure honey they gathered from the flowers of the broom.

This appeared to our correspondent the very finest honey he had met with in England, and we may rely upon his judgment. Therefore, wherever there is an opportunity of a broom field with wild thyme, it will be worth while, even at some expence, to fix a stand of bees.

From the honey of these hives a *CAPILLAIRE* may be made of equal virtues, and equally pleasant with that of Montpellier, and we may save the money, that goes out of the kingdom annually, for this frivolous article.

The only ingredient beside is maiden hair; and our black maiden hair, which is common on old walls and under shady hedges in many parts of the kingdom, will answer the purpose of this very well.

Let the person, who shall attempt to make this syrup in England, get the right herb and use this fragrant honey, and he will not fail. He must not buy the plant at the herb shops, for they usually sell a common kind of fern in its place, which is nauseous and has no virtue.

#### C H A P. CXVIII.

##### *Of plants hurtful to bees.*

**A**RISTOMACHUS, who spent seventy two years of his long life in observing the Economy of bees, does not seem to have understood them so well as the gentleman, to whom we owe these observations; nor has any one studied them with so much regard to use. After examining by these most certain experiments, what those plants were which bees most loved, and what effect they took upon the honey; he bestowed his attention upon those kinds which were disagreeable to them, and hurt them.

We have a weed called *STINKING ORACH*, *ATRIFLEX OLIDA*, an excellent medicine, but a very offensive herb to bees. Unluckily it is common in farm yards and neglected gardens. Bees hate all stinks, and they seem in a particular manner to detest this.

Our correspondent observed in a cow-keeper's garden near London, in 1748, a great quantity of this plant growing all about the beehives, and under the very stand. The man complained that his bees were always thin in the swarm, and produced little honey. He was advised to destroy all this weed, and digging up the ground, and throwing in some mould, to plant baum and hyssop, and winter savory in the place. He did so, and writing the gentleman, who gave him the advice, a letter of thanks, three years after, he said his bees had thrived excellently upon this change, and continued in the same state ever since.

Elder should never be planted near where there are bees. The flowers feed many insects, but they are hurtful to these. There is a considerable quantity of wax to be collected from them; and sometimes in distress, bees will seek it there, but their honey always get a sickly flavour by it; and the bees themselves become unhealthy.

The common single narcissus or daffadil; is another plant

that does harm to bees. They get an ill-tasted honey from the bottom of this flower, but it does them nothing but harm: they grow faint and languid after it, and in places where this flower is very plentiful, the honey is greatly debased by it; becoming thick, and of a heavy and vapid flavour.

It is strange, that experience here contradicts the doctrine of the antients, who, in general, have understood bees very well; they direct the narcissus to be one of the plants cultivated near the hives: but there are many kinds of narcissus; and it is not improbable they meant the white kind with the purple circle, which we call the poetick daffodil. What effect this may have we don't pretend to say, having only observed the yellow kind.

Among shrubs, there is only one in our hedges which is yet known to be very hurtful: this is the *DOGBERRY HAZEL*, called by the Latin writers, *CORPUS FEMINA*. The flowers of this throw the bees into incurable disorders. They are tempted, on certain occasions, to use them freely, and great numbers perish.

In general, nature has very well taught this little creature what to seek and what to avoid; but the greatest danger to which it can be exposed, is that of being near a garden of foreign plants. Many of those, our curious people raise, are poisonous. I once saw a remarkable instance of a great number of bees being destroyed by a peculiar kind of apocynum, or dogs bane. This kills flies while they play about its flowers; and a gentleman having raised some of it not far from the place where his hives stood, the bees were fond of the flowers, and perished by their poison so suddenly, that multitudes of dead ones were found continually upon the ground, round about the plants.

There are many other herbs raised for curiosity, which are of the same poisonous nature, and bees are much more in danger from them, than from any which are the produce of our own country: whether the instinct, which directs them, be limited to the plants of our own growth, or howsoever it is, we find not only these small animals, but larger creatures also in much more danger from those herbs, which the art of man has introduced into the countries where they live, and feed them from all that are brought into their way by nature.

It is said, honey is sometimes rendered poisonous by the bees having fed on poisonous flowers, but we meet with no certain instance to confirm it; nor is the thing likely, since we find the bees themselves are affected by plants of this kind themselves, and would, after feeding on poisons, dye before they could discharge their honey into the cells of the comb. This seems one of the rash assertions of those men who place their imagination in the stead of observation; and repeat as facts, what their fancy has suggested; although it be what their mature reason would contradict.

It is an observation of Columella, that the elm is hurtful to bees. The flowers of this tree appear early in spring; and they are small and inconsiderable, they grow also on the tops of the trees, and therefore we scarce observe them, except when they are fallen off, in which state we find them scattered on the ground about the stems of the trees.

Our correspondent, who has been so curious on other heads in regard to the bee, did not omit his observations upon this: but whether the effect of climate, or whatever else, makes the difference between the bees of England and those of Italy, it is evident, that here these flowers take no ill effect upon them. They afford a considerable quantity of honey, at a time when these little creatures are in extremum want of it; and therefore our bees feed greedily upon them; but without hurt, either to themselves or their stock.

Two or three of the early flowering shrubs are violently purgative, as the mezereon of our gardens, and the Laureola or spurge laurel of our woods, of which we have given an account at the latter end of the third volume, treating of hurtful plants. The flowers of these shrubs invite the bees which have had none for so long a time; and they are killed by them in great numbers. To prevent this, our correspondent has found an excellent medicine. He observes, that the drug called Japan earth, is a remedy for the ill effects of these spring flowers; and that its taste being sweet, the bees feed on it very readily when boiled up in water and mixed with honey. Columella names the spring spurge at the same time as the elm; and attributes the disorders of the bees, at this season, to one as well as the other: probably it is this laureola he means, and that is a plant more likely to occasion the effect than the other. Whichever it be, or from whatever herb, this is a remedy. Certainly, where mezereon is common, the bees in spring perish by it, as if they were poisoned.



## C H A P. CXIX.

*Of a new use of human excrement.*

**A**CCIDENT, the parent of the greatest part of our useful knowledge, has discovered a new use in the manure from human excrements, of which we have spoken in general in the preceding volumes. There is something in the highest degree disgusting in the thought of using this manure for any thing that is to be taken again into the body. But any use is better than for bread; and it is particular, that in the present instance, though used for fruit, it gives no ill flavour in the least to them.

One would be led to think from this, that the absolute taste of manure cannot affect the product of trees, though we perfectly well know it can affect that of herbaceous plants; and that, although cabbages, and the like products of the kitchen garden, are rendered more or less offensive, according to the quantity of horse dung that is used in the ground, yet in the larger growths with woody stalks, no taste or flavour is received from the ingredient. This would lead us to a plain use of the most offensive manures, in cases where they would be highly proper; and the quantity of human excrement, in particular, that is made in London, affords a reason for trying it thoroughly.

The incident which gave occasion to these observations, is the following. It comes ascertained by unquestionable authority.

A chymist in London, who made the famous preparation PHOSPHORUS, found, by long experience, that a mixture of human urine and excrements, answered much better than urine alone; of which it had been usually made. These ingredients were to putrify together before they were fit for the purpose, and a very large quantity of them yielding but a little of the phosphorus, the stench in the streets of London was unsufferable. This gentleman was obliged therefore to take a small house just out of town, in the fields toward Marybone, which had a little garden enclosed within a high old wall. This answered his purpose: for the stench of his ingredients was not unlike that of the neighbouring dunghills, and the practice was altogether unobserved.

The garden being of no use, went to decay: but some fruit trees remained, particularly one antient pear tree. Neglect had robbed this long of its fertility, and it was overgrown with moss. To the trunk of this tree was fastened a kind of circular shed, under which the human excrements and urine were set to putrify. The business succeeded very well, and a surprising change appeared in the old tree. It had for many years been barren, but it now became fertile beyond all thought. The fruit was more than could well be supported by the branches, and was fairer to the eye, and finer to the taste than the generality of pears of that kind. The taste was a point so much suspected, that the proprietor would not take his own judgment, nor that of the people in the shop, but brought them to table among his friends and acquaintance: all approved them particularly; and at length, one of the best of our gardeners happening to dine with him, was so taken with the improvement of that pear, which he called by its name, but said it was finer than he had ever known it: he begged the secret, which I suppose he has practised with success since, though he has not been so generous to the world as the chemist was to him in disclosing it.

The practice, in some degree, confirms the doctrines of the antient agriculture. The Romans have spoke of human excrements as the richest of all dung; and naturally indeed it must be so, since they are produced from the richest foods: but they had not at first the art of using it, and they found it too hot: they complain that it burnt up the ground. Varro and Columella agree, that urine of our own species, after it has been kept half a year to ferment, is excellent for fruit trees. They are particular in recommending it for the pomegranate trees, and for vines, and they boast of the particular fine flavour of the fruit and of the vine, raised from this dressing.

What they speak of the urine alone, we see holds true of that and the excrement together; and perhaps he, who shall find the way of using these best, will make a greater improvement, than any of late ages have done, in the useful arts.

It appears by experiments, that human excrements are of the nature of those manures, which will bear a great deal of addition: for that fermenting slowly, they communicate that fermentation without damage to a great quantity of matter. The old Romans advise mixing with it the refuse and sweepings of the yard; and lately we have received accounts of its being tried with success, with a great quantity of the dirt of highways; and with calcined clay.

This last mixture will probably be the best of all for fruit trees; and in extream cases, it may be proper to let the matter take its fermentation at the root of the tree, as was the case in this accidental trial. When the tree is not so far gone, the best way will be to uncover the roots, and lay in some of the mixture, and afterwards to cover it up again with two inches of mould. On this occasion, it will be proper to remind the farmer, how far the roots of fruit trees, as well as others, run in the ground; and that he may apply this kind of dressing for any old tree, at the distance of five and twenty foot every way from the stem, with great propriety.

It often happens, there is an old orchard belonging to the farm, which produces very little, and which he cannot turn to any other use; this will be an excellent opportunity for the use of human excrements. Let him mix up a large quantity of these with the refuse of the yard; and with some road dirt, and give a plentiful dressing to all the trees. If, at the same time, he will cut off a few of the worst boughs, so as to contrive that the sun and air may have free passage among the rest; he will at once restore the ground from bearing little or nothing, to an excellent condition; and will have, not only plenty of fruit, but those excellent in their kind.

## C H A P. CXX.

*Of blood.*

**F**RUIT trees have been lately found, by careful observation, to be extremely enriched by blood. In London, the butchers find purchasers for blood of cattle when they have it in great quantity: and when less, it is often wasted. In the country, butchers have found its use for their fruit trees, and in several places in Sussex, they bury it about the roots in orchards, and in the borders wherein their wall trees stand.

It is an observation of the excellent writer Evelyn, that not only blood of animals, but their flesh, is an excellent and rich manure for all kinds of growths. He relates, from indisputable testimony, one great instance, though a very horrible one, of this truth. A battle was fought in Badnam fields in Devonshire, not more remarkable for the victory gained by the earl of Hopton, than for the obstinacy of the dispute on the side of the vanquished: the blood that was shed, was perhaps more than from any instance of equal numbers; and the fields which received it, were, for the succeeding years, rendered fertile, in a degree not known before. The fact is certain, and the reasoning is not strange; for we know the blood of all animals promotes vegetation.

From this, and from what we have read and seen, concerning the effects of putrefying flesh, the farmer may learn a useful lesson. There will always be, in great towns, a large quantity of animal refuse; and in smaller a proportion: even in his own family some. Let him know its value. He may have it at a very moderate price; and when he has no immediate opportunity to use it on his land, he may mix it up in his dunghills; or even make it up into dunghills only with earth and weeds. The power it has of fermentation with mould, will convert the whole into manure, and that of the richest kind. That the flesh of animals has the same effect with the human excrements, though perhaps in a somewhat less degree, we have lately seen in an instance at Richmond; where a dead dog, a favourite mastiff, being buried at the foot of a standard apricot tree, which had been accustomed to bear but little, the produce afterwards increased vastly. The family were not fond of eating the fruit, because they knew the cause; but their delicacy extending no farther than to themselves, they gave it in large quantities among their friends and acquaintance, and it was universally admired.

## C H A P. CXXI.

*Of the damage of liming feeding grounds improperly.*

**T**HE improvement by lime upon corn land, early in the time of its general use, led people to lay it also on pasture ground; and the improvement that followed was certain, but often there came with it an unseen damage. The cattle, which feed on such grounds, fall into disorders. The quantity of grass is much greater after this dressing, and even the quantity of the nourishment in every blade. Horses, oxen, and sheep, are equally fond of it; and it does harm to all, but most to sheep; which it always throws into some disorder, and if the season prove wet afterwards, they generally get the rot.

The farmer is not, for this reason, to give up so excellent manure; all he is to do is to use it with discretion.

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Instead



Instead of throwing on forty or fifty bushels to an acre, let him content himself with about five and twenty; and let this be thrown on at such a time, that its greatest effect will be upon the crop for hay; not that for feeding. Thus, let a piece of pasture ground, that is intended for liming, be eaten down sooner than the others, and the lime then thrown on toward the end of winter. Let the spring feeding be given up, for it is trifling in itself; and let the land be shut up from the time of the lime being thrown on. Let the charge of a labourer be added to follow the cart, that he may spread it very carefully; and leave the rest to the rains and seasons. The whole first strength of the lime will thus go into the shoot for hay, and the crop will be vastly richer for it, and will be ready to cut earlier than others. If only the quantity of lime, we have directed, be used, let the cattle be turned in after the hay is off the ground; but if, according to the custom of the lime countries, the usual large proportion have been thrown on, then let the land be kept up for a second crop; which will probably be a very plentiful one; and after this the cattle may be put in without fear.

Stone lime is best for corn grounds; but for pasturage that is most profitable, which is made of the softest materials. Lime made of chalk is better than that of stone; but the best of all is that which may be made from some of the light chalky marles. Of late shell lime has been made in great abundance; and from this much good has come to grass grounds, the refuse having been used for this purpose.

We have before spoke of the use of lime water for pasture grounds; and perhaps experience will at length reduce the practice to this, that when these soft materials are burnt into lime, the stone itself, if it may be so called, should be used for grass grounds; but when stone lime, that is, such as is burnt from hard stones, is used, the best way will be to apply it in the water.

What we have lately seen in the grass part of a very elegant garden near town, confirms this. The gardener was advised to sprinkle lime water to kill the worms, which spoiled the grass plats; and it took that effect very well: but there was also a great good, which he did not expect. The quantity of grass became much greater; so that all the thin spots and bare places were rendered as green and velvety as the rest; and the strength at the root was so great, that in a succeeding drought of more than five weeks, which happened in the beginning of this summer, and which spoiled all the grass walks in the neighbourhood, the grass of this garden held a fine fresh verdure. This is a plain and certain fact: the effect could be owing to no other cause; and it teaches the gardener an excellent art.

#### C H A P. CXXII.

##### *Of harrowing.*

A Farmer in Buckinghamshire complained among his neighbours that his crops did not succeed, though he spared none of the usual expence; and particularly, that his harrowing was never done well, though his land was of the same nature with theirs, and he harrowed it no less than they did. What they could not amend, nor explain to him, was in itself very easy to be seen. The effect of harrowing is the tearing to pieces the clods of earth, and this requires that the harrow be drawn roughly and hastily over the ground; for if it be dragged slow and gently, those clods will turn out of the way of the tines, that would otherwise have been torn to pieces by them, and the whole operation may be performed without any effect.

This farmer had two very old and very poor horses, lame and blind both; which he kept on little, and that bad food, and used only for the meanest purposes.

These were the horses he employed in harrowing, and being weak from infirmities, and weaker yet from their poor feeding; and under the guidance of a lazy driver, they crawled over the ground, and drew the harrow so very softly after them, that it either rose over, or run between all the clods it was intended to have broke.

We have shewn of how much importance harrowing is in our preceding volumes; and the gardener would be as wise who should pretend to exclude raking from the ground, as he who should set aside the harrow for the farm: to perform its business so ineffectually, is the same thing with setting it aside; at least, it is in effect the same, and he who chuses to omit it entirely, will perhaps fare better, because he will take more care in the other operations.

It is a very just observation of that universal collector, Mr. Lisle, that when oxen are used for harrowing in hard lands, they do little or no service, because they go so slowly. The farmer will learn, by these misconducts of others, to use the right kind of cattle, and to manage

them in the proper manner, in this needful operation. The brisker they are, under the conduct of a good driver, the better the work will be done.

The stiffer the land, the more essential is the care in this article; for in the fine grounds; and those of the adjacent country, which have a soft, black, mellow soil, the slowest and slightest harrowing answers the purpose.

On the contrary, in clays just reduced to tillage, or in the very stiff loams, a great deal depends upon the harrow, not only for burying and covering the seed; but for the absolute affair of tillage: such ground is always getting towards its old state of heaviness and hardness again; and the harrow is the great instrument on which the rendering it fine depends.

A great deal depends also upon the flat position of the harrow on the ground, but this is not enough regarded: on the contrary, I have seen a driver, for the sake of easing the draught to the cattle, set the harrow purposely slanting upwards, as coachmen throw the coach forward, to ease their horses. The consequence of easing the cattle is certain, but that is a trifle; the business is ill performed: for the harrow being raised in its forepart over the level, the rest easily follow the same course, and the clods that should be broke are at most only pushed out of the way.

It is an excellent practice they have upon their stiff lands in Northamptonshire, of going with three harrows at once: the third harrow, in this case, certainly keeps down the other two; and it takes whatever they happen to miss.

The course in which the harrow is drawn, is an article of no small consequence toward the perfecting that operation. In going directly across, it often happens, that where the land is very stiff, the harrow turns the furrows back again. In this case, the harrows should be drawn assant, and in that direction they will never fail to do their business. They follow the cattle heavily in this way; but they will certainly perform their office: for the clods lying crosswise of them, may be turned away, instead of being broken, but when it is thus drawn assant, if a clod be so tough that it escapes one of the tines, it is thrown in a different direction before another, and is thus certain to be torn to pieces by one or other of them.

As much as possible, let the farmer avoid harrowing in very wet weather; for though the work may seem well done, there may be a great deal of mischief. The horses feet may have trod a great deal of the lower part of the ground into cakes, though the surface appear fine and well wrought.

In ill-managed harrowings, or unlucky conditions of the ground, it will sometimes happen, that the repetition of this work throws up a part of the seed. In this case the most advisable way is to drive sheep over the ground. Their feet will thrust the seed in again, and a very light harrowing after this will cover it excellently. This practice is not unlike the gardeners way of covering seed, by trampling it in, and then raking it. We know that no seed is better sown than what is thus managed; and we may be certain, that what succeeds so well in the garden, will not fail in the field.

Perhaps an improvement upon this method may be easily made, by a short tined harrow. The sheep, by treading in the wheat, will naturally trample down the clods, and bring the ground to a kind of level; and when it is in this condition, the long and sharp tines of the common harrow cannot be necessary for the covering in the naked corns: the kind of harrow we propose would lay all level, in the manner of a garden rake; and the corn would be covered more regularly than it could by the usual method.

We do not attempt to prefer this method to the drill sowing, nor indeed to compare it with that excellent contrivance, for by that instrument all the seed corn is let in regularly, and covered equally. This method would be coming something nearer than the common, to that regular practice, and would have a proportioned advantage.

#### C H A P. CXXIII.

##### *Of clearing the ground for plowing.*

THE farmer may often, by a very small expence properly applied, save a great deal both of charge and trouble, in his succeeding work. The quantity of large stones which they plow in among their stiff loams, in many parts of this kingdom, would be much better picked off first. The plow would perform its office the more perfectly, and the corn would have a fairer chance.

Where this is omitted, a very careful eye should be kept upon the plowman; for unless he does his part with fidelity and integrity, the ground will in many places have very little benefit. Every large stone will turn up the plow,



plow, unless the person who holds it be very careful, and very diligent; and even in this case he should be relieved at times by another, for the labour is too great for any one man to keep the plow fairly pressed down in such a ground.

What we say here relates to large stones only; small ones have not these inconveniencies, nor are they hurtful to the crop as the large ones are; they often help the ground.

All the succeeding operations of husbandry are interrupted by large stones, as well as the plowing. It is impossible to roll the ground well, for the irregularity of the surface made by these stones, raises up the roller in several places, and makes it press unequally in others. The roller is intended to crush and break the lumps and clods which came in its way, these being only earthy, but it can only press these stones in, and that very imperfectly. They give the same disturbance in harrowing, and afterwards in the taking up of barley. Indeed they are, on all occasions, so great a disturbance and interruption to the work, that it is an unpardonable piece of negligence to leave them on the ground. In tough soils the stones make such a destruction of the tackle, that common economy would teach the farmer to have them removed, before he sent in the plow; if there were no other motive. Clay that has lain to be very hard, and has large stones in it, will hold them so fast, that the plow cannot remove them. And all the advantage of having a careful plowman who shall fairly attempt it, will be the turning up a very few, and the breaking of the plow against others; neither can the other operations be performed at all, without more cattle, and more expence; and then very imperfectly.

These are the reasons, and they are very plain ones, why the farmer should be at the small charge of having these larger stones cleared off the ground; and they are needed in all their force, for nothing is more neglected.

Clayey soils are those on which the stones of this larger kind are most troublesome, and do most damage: there are grounds so light and dry, that it is an advantage to have some such assistances; but here flat stones, not heavy lumps, are what do the good. The others should be taken off even from those.

Of all crops, there is none to which these stones do so much harm as clover: they must with double caution be picked from thence; nor is there any expence of labour in getting them out of the ground, that will not be amply worth while for the sake of the crop. The advantage of a single mowing often making up for the whole.

Let the farmer understand in this whole direction, that the large size of the stones is what makes them detrimental to the land; and let him distinguish what are the kinds of ground that suffer most by them. We have told him, in the preceding volumes, that there are lands to which small stones serve as a kind of manure; and the instance is famous in history of those, who by laboriously picking every one off grounds where they were proper, rendered them barren, and found no way to relief but by putting them on again. Reason must direct in all the operations of husbandry, else the best rule being misapplied, will do nothing but mischief.

#### CHAP. CXXIV.

##### *Of rolling.*

THE intent of rolling wheat-land after it is sowed, is to press down the little lumps, and make the mould lie close to the grain. This is the more necessary, as the ground is lighter; and where it is lightest and loosest of all, the turning in some sheep to tread it down, answers the purpose better even than the roller, for their feet being small and hard, and pressed by the weight of the body, leave no spot untouched, nor any ground loose.

In the rolling of plowed lands, the heavier the roller is the better: and in the case of such as are very weighty, let the farmer take care he allows horses enough to draw them. If these creatures find the weight hard to pull after them, their feet do a great deal of damage, by forcing the seed out of its place, and treading it in too harshly: but when the roller is heavy, and the cattle draw it easily to themselves, every clod of earth is broke, and the seed, while it is fixed in its place, has yet a free soil to shoot through, without any thing to turn the first shoot out of its course.

More caution is necessary on this account, when the corn is up before it is rolled; for if the roller drag heavily, the young growth will suffer very much by the feet of the horses. In this case the horses should never go in a length, but two abreast, that there may be the less trampling in one another's footings.

It is a practice with the farmers in some countries, where many of the lands are stony, to nail their rollers all over with broad-headed nails, that they may take the more effect upon the stones, and may not be worn by them; but this is a very foolish custom; especially in rolling when the corn is up, for the blades are cut to pieces between the iron and the stone, though they might have escaped between that and the wood.

In loose land, which is free from lumps, at least from hard ones, the sooner the roller is brought on, after sowing, the better: for the purpose will be answered, and the body of the grain being hard, cannot be hurt; but in ground that is full of lumps, and those too hard to break freely, the best time of rolling is just after a shower of rain; for they will then fall to pieces under the roller, though they would have resisted it, or only have been pressed into the ground by it before.

The shallower wheat is sowed, the more necessity there is of rolling it; we see instances of its succeeding very well without any rolling, where the ground is loose, and the wheat is sown deep. When they plow round furrows, and lay in the corn deep, even though the soil be loose, it succeeds very well: for it grows as readily from that depth, as if nearer the surface; and the lightness of the coat of the ground in that part does no harm, for the grain is secure from accidents by its depth, and it roots downward.

The rolling wheat immediately after sowing, is a very good practice, for the mould is better fixed about it at once: the frost is kept out by the closeness of the soil; and the effect of the unfavourable seasons that may follow, is very happily prevented.

The rolling of clover sown upon light ground, in winter, is always of great service to it, by pressing the mould to the seed.

#### CHAP. CXXV.

##### *Of feeding of cattle.*

WE are in too much haste to kill our cattle in England, and by that spoil the greatest part of our food. Sheep should not be killed for mutton till six years old. In our hasty way of feeding, we bring a cow calf up to the condition of beef in less than three years; but it is wrong: for the creature grows till somewhat more than three years old, and there can be no good expected of it till that is over. Oxen grow longer and for that reason should not be killed till later in their time. They have not their full maturity till five years old, and the largest kinds of all not till six, and they will never fatten kindly for beef till that time is past. The fattening of such cattle as are just at the prime of their growth, is very easy, for they naturally are inclined to it at that time, the consumption of nourishment for their growth being just over, they will feed upon almost any kind of food, and will fatten upon hay as well as upon grass: but older cattle do not so readily take to fatness; and the best method is by very rich and good fresh pasturage.

Corn is excellent for the fattening of cattle, because it fills them with a sound flesh, and excellent fat. At all times the country gentleman should feed them thus for his own table: and when corn is cheap, it will be worth the farmer's consideration; for he will get both credit and profit from it.

A very natural imitation of this excellent practice, is the giving cattle the larger kind of malt dust, called the tails of the malt. The proper corn is barley, and the next in goodness to this is oats; either will answer very well. They should be ground, and given the beast dry. When malt dust is used in the place of corn, the custom is to boil it in water, and in this manner the creatures will eat it very freely. A quart of the malt dust is enough for a gallon of water; and the creature may have a mess of it three times a day. The effect of it appears to the eye to be the same with that of the corn, for the creature grows plump upon it; and any one would suppose it in fine order: but the fat is not sound, and it is really a deception. No one would feed cattle in this manner for his own use; and there will be no credit got by sending them to market. The merchant knows the old proverb is true, which calls integrity the best wisdom, and the farmer will find it equally: in all his dealings let him be honest, and his character will be a fortune.

No food makes an ox or cow fatten so well, as good grass; the pasture of upland grounds is best from spring to Midsummer; and from Midsummer till spring again the lower ground, where grass has more moisture. These will always finish the fattening, but the high grounds are best for laying the foundation: for their pasturage is the most healthy, and health is the best source of fatness.

We



We see sheep which have fallen into disorders by feeding in low grounds, grow well without remedies, by being removed into such as are higher, and more dry; and in the worst case of all, as in the rot, where there is need of the most powerful medicines, they take effect much the sooner for this change of food; and in many cases will not succeed at all, but with this assistance.

Therefore reason as well as experience direct this course of feeding, that cattle should be turned first into a very good dry upland pasture for a small time, where they may have rest, and this wholesome food; they will thus lay in a foundation of health and good condition, and being after that turned into lower grounds, where there is abundance of food, they will have good appetite and good digestion, and will fatten perfectly. This is the natural and the creditable way; and when corn is dear, nothing more needs to be done; but when there can be an addition of oats or barley in the manner we have directed, the advantage will be very great. The best time of giving this, is toward the end of the feeding.

Clover is excellent to lay a foundation for fattening of cows; but when winter comes on, they must be removed out of it into the aftermath of the common pastures: for the broad leaves of the clover detain so much dew, that they are wet all day, and cattle will never fatten upon food that has too much water in it. The nourishment of the common grass at this time, and in this condition, is not to be compared with that of clover at the same season; but we see by this, that less nourishment will do better, where it is not overcharged with moisture. There is no article more delicate than that of fattening of cattle; few are of more importance, and scarce any is so little understood. What has been written in general is obscure, always confused, and often contradictory: experience and observation are the only guides; and what we give the reader, is the result of the experience of others confirmed by our own. Mr. Lisle has enquired into this article with attention; and we owe to him a great deal of the useful knowledge we have communicated on this and the preceding head to the reader; but we give nothing on his or any author's words alone; nor are we so rash as to contradict without authority of observation. Nothing could be so idle, as to oppose opinion to experience. But where we have seen confirms what he had heard, the reader has it; and he may place so much the more dependance on it, as there is the weight of additional observation.

Some foods are excellent for smaller cattle, but are limited to that use. We have observed in the preceding volumes, that hop trefoil is excellent for sheep. Mr. Lisle quotes the observation of a farmer of experience, that this plant and broad clover made into hay, would not fatten large cattle well. Mr. Lisle fancied it was only in regard to the vast oxen of Wiltshire, that this was true: but experience shews, the farmer was in the right. How far the broad clover enters into this assertion, I cannot say, not having seen fair trials of it singly; but the hop trefoil hay, though it is a wholesome and excellent food, will not answer in the fattening any kind of oxen whatsoever. Nor indeed does any dry food answer that purpose perfectly.

To speak from the general result of a careful observation; there seem to be three stages of feeding in the bringing cattle to their greatest perfection for the butcher. The first thing is to give them health, strength, and vigour of constitution, which is best done by hearty food that has but little moisture; such is the grass of upland pastures; and of all others, those pastures which abound with this kind of trefoil, whether the plant grow naturally there, or be the result of art, the farmer having sown it among the grass: the hay of such clover or trefoil also will answer excellently for this purpose. The second stage of feeding is by giving them plenty of nourishment, which is moist and rich, though not too watery. This gives abundance of flesh and fat; and finally, the last stage of all should be the finishing them with a little dry food of the corn kind, which will harden the fat, and give both that and the rest of the flesh due firmness, and an excellent flavour.

The farmer is aware of the advantage, indeed, of the necessity of this last article in the feeding of hogs; and it is strange it never should have occurred to him, that the same benefit would certainly flow from the same practice, in regard to cattle of a larger kind. Whatever food he has used to bring the hog into flesh, he finishes it up with pease, to give that due quality to the fat on which the value of the bacon depends. Pease are the hogs corn; and what they do for that animal, corn will for the ox or cow. This is the lesson which reason would inculcate, and he will be happy who follows it.

There is great uneasiness attends the attempt, when cat-

tle do not take to fattening kindly; and often they are in but very indifferent condition; when they deceive not the owner alone but the salesman. This method of feeding will at all times prevent these uneasinesses and disappointments, and the farmer will have not only quiet but credit.

Among all the artificial grasses, as they are called, none is so fit for the fattening of cattle in the state of hay as lucern. It will answer the purpose of other food when scarce, during the winter; but in spring something must be done to keep it: for by that time the hay grows dry, and has lost the best of its fattening quality. This, however, is an excellent food by way of preparation; and the creature will be so well in health and strong upon it, that till the very end of the feeding, little more need be done. In spring let him be turned into some good pasture ground, before it is laid up for hay; and let the finishing be with corn, as already directed. This will give the greatest perfection.

#### C H A P. CXXVI.

##### *Of driving cattle.*

ALL the farmer's care is often fruitless in the fattening of cattle, when he depends upon a distant sale; for the carelessness or ill management of the drovers, will reduce a fat ox to a very poor condition. Quietness in driving is a great article; and good food upon the road is another. An ox upon the road ought to have seven pound of hay for his evening bait; and the same quantity in the morning. If he have less than this he will lose his flesh. The custom is, to throw the quantity of hay that is to serve for evening and morning into the rack together; but it is a bad one: an ox is a very nice creature, and does not feed freely on the food he has breathed long upon. The creature would eat it with the much better relish, if it were divided into two equal parts, and given separately night and morning.

When cattle are overdrove they grow faint, weary and sickly; and it is then the best way to sell them as quickly as possible. They will fall into illnesses if not disposed of; and they will sell much best while they are just come in and warm; for they feel better while that warmth is in them, than they will when they have stood to be cold.

With regard to cow-beef, the older the creature is, the more perfectly it will require to be fattened, for the flesh of a young cow will eat tolerably, though it be but half fed; but that of an old one, till thoroughly fatted, is scarce eatable.

In buying oxen for feeding, a great deal of regard must be had to the health and shape. If they be not well, nothing will make them take to feeding till they are cured; and it is not the farmers business to stand that hazard. If his cattle fall ill while he has them, we have told him what are the remedies, but he is distracted who buys them so.

It is a common notion, that no ox will fatten well unless his bones lie even and well; but late experience proves this to be an error: provided the creature is in health, this is of no consequence.

A thick leg is a good mark of an ox that will feed kindly; and the larger his foot the better.

Another excellent mark is the firmness of the skin about the neck. Many oxen have it hanging lank and flabby, but these never fatten so well as the others. A good breadth between the huckle bones is another essential circumstance; indeed, the most essential of all: for it is this which gives room for his feeding. A depth in the brisket is such another article; for this is a point that gives room for feeding. Therefore, the deeper the creature is from the upper part of the shoulder to the neck, the more is to be expected from him, when well fed. Finally, he should be short rib'd, and regular made in that respect, for a false rib that lies deep, makes the flank fall in; and is always a disagreeable thing to the grazier.

#### C H A P. CXXVII.

##### *Of lime.*

THE use of lime, which is now in a manner universal, may be extended almost to all subjects, as well as all places; and the advantages arising from it, are more than those which first appear.

The two great disadvantages in a crop of turneps, are their being subject to grow sticky; and their being eaten by worms. Both these the use of lime upon the ground prevents. Experience shews, that the juices continue longer in the earth which has been fertilized by lime, than in that which owes its richness to any other manure; and this prevents the roots of the turneps from growing hollow or sticky.



sticky. The other effect is very plain; for the great quality of lime after its fertility, is the destruction of insects.

This gives it, on many accounts, a vast preference over dung, when the crop to be raised is of the root kind. We know by very troublesome experience, that dung gives an ill flavour to roots, and that it promotes the breeding of worms. Lime gives an equal degree of fertility to the ground, at least; perhaps a much greater; and it always gives a sweetness to the roots, at the same time that it preserves them in good condition a long while; and destroys the insects which would deface and devour them.

The turnep is not the only root which may receive benefit from this manure: carrots are very profitable to the farmer, and the ground wherein they delight to grow is of a nature that very well agrees with this manure, for lime does no where better than on light dry soils. The experiment has been made last year in a small spot of garden ground, and succeeded happily. The carrots took their growth very quick, and consequently were extremely tender; and none were ever sweeter tasted. There was not one in the crop worm eaten, nor a worm to be seen in the ground, till we came to a depth beyond where the effect of the lime had reached. This was more particular than it would have been, if the worms had been utterly destroyed or driven out of the ground; for that manure must be very powerful indeed which could keep them at such a depth, when there were roots of which they are so fond in the upper part of the ground.

The only inconvenience to which a turnep field is subject, where lime is the manure, is that the fly may possibly come, which takes the plants in the seed leaf. This it has only in common with other grounds; and the best way yet found to be secure against this, is by steeping the seed. Many ingredients have been used for that purpose; but the receipt which has succeeded best within my knowledge upon late trials, is this.

Bruise an ounce and half of camphire, tie it up in a piece of muslin, and put it into a large bottle, with two quarts of rain water; set it by cold, and shake it every day for three weeks. Then shred small a quantity of tobacco stalks, or other refuse of tobacco, and bruise an equal weight of wood foot. Pour upon these as much boiling water as will wet them very well. Stir the whole about, and let it stand twelve hours; press this out hard, and add to it the camphire water, which will by that time be very strong. Mix these two liquors together by a good shaking, and then steep the turnep seed in them. When it has lain the usual time, pour off the liquor into a pan, and let it stand by, then sift over the seeds a mixture of four parts lime, and one part flower of brimstone. When the seed is candied as it were with this, sow it; and four days after sprinkle over the ground the liquor in which it has been steeped. This will promote the growth of the seeds, and at the same time it will render the mould about the plants, and the seed leaves, which it will thoroughly impregnate, so nauseous to the whole insect tribe, that nothing can tempt them to come near the place.

According to the newness or staleness of the seed, and to the dryness or wetness of the season, this liquor should be sprinkled over the ground. The intent of it is to penetrate into the seed leaves, just as they are beginning to swell for their growth: for in this case it absolutely enters into their very substance, and renders them hateful to those creatures, which otherwise would have fed on them. If it be thrown on before the seed have lain long enough in the ground to swell and crack, it will answer no purpose, for the seed leaves which it should impregnate are not yet formed sufficiently to receive it: and on the other hand, if it be omitted till they are hardened, it will run off from their surface, and give no lasting tincture to their juices.

Where I have seen this tried, it has sometimes succeeded extremely well; and at other times, though all the same precautions were used, it answered but moderately. There require many trials to ascertain this; but there seemed to me, in those instances I had opportunity of observing, to be a great deal dependant on the season. When a dry time followed, the flies were but few upon these plants, though in general this favours them: and, on the contrary, when there came some sharp and hasty showers, the flies seemed to have fallen from the clouds with the rain, for they increased upon it; whereas it was more natural to have supposed they would have been destroyed. We are not to judge in these instances by what would have been the case without the use of the liquor; but it is probable that in the dryer seasons it took effect, because it lodged on, and in some degree penetrated into the substance of the leaves; whereas, in the other case, the hasty showers washed it off from their surface. It is for this reason the liquor is here directed to

be sprinkled so early on the ground, that it may have the better opportunity of absolutely penetrating into the substance of the tender seed leaves, and may be out of the reach of a hasty shower to wash off.

## CHAP. CXXVIII.

### *On recovering a crop of decaying pease.*

THE drought that happened in the earlier part of the present summer, threatened a farmer's pea ground, which lay near his house, with an entire destruction, just at the time of their flowering. The common observation is; that the season which happens just at the blooming time, determine the value of the crop. It should be warm and moist. There was warmth enough; but the want of rain made the leaves turn pale, and the stems grew dry and harsh. The farmer was a disciple of the new method in husbandry, and he now was determined to try its promised advantages. The ground of this pea field was very light and loose, and he had sowed them in rows, though not at that distance the directions of Mr. Tull require. The regularity of the crop however gave him opportunity of working between the rows, and he determined to use it. There was not room for a plow of any kind, for the intervals were trifling. But he took advantage of the loose nature of the soil, and sent in four hoes, whose work he over-looked himself. They had strong hoes, and he made them cut into the ground every where to the full depth of the blades of them. The consequence was such, as shews very plainly the truth of all we have advanced upon that head, since this imperfect way of breaking the ground, answered the purpose of the farmer, even in a time of absolute drought.

Mr. Tull has said, and we have repeated it under the sanction of more experience, that the horseshoeing of lands while the crop is upon them, will, in dry seasons, answer the purpose of watering. This was the very experiment that was tried upon the present occasion. The ground was excellent, and it was in fine order; the pease had taken their growth to the time of flowering, with all possible regularity; and there wanted now rain, and nothing else, to make them flower in great perfection. It was deficient just at the time when wanted most of all; and the farmer saw the effects, and gave up his crop as spoiled: watering the whole field was a labour not to be thought of. Hoeing was a great deal, but much less than the other; and it would answer the purpose of destroying a young growth of weeds, as well as that of supplying moisture.

The ground was very well wrought throughout with these strong hoes; and the farmer, who was intent upon the consequence, as he had ventured a considerable sum, out of the common course of his business, watched the pease from day to day; he soon found that the earth which had been dry before, was moist after this work; and he saw the leaves of all the crop grow plump and green again. He observed the stalks began to look round, and fresh also at the bottom, and in a little time more the same thriving aspect appeared in the upper parts of the stalks, and in all the branches.

There is a peculiar look in things which are in health; and the farmers know it better than the philosopher. In particular, the field pea, when it is in perfect vigour, has the stalk covered with a kind of bloom, like that upon a plum: a sort of loose light powder, which gives an aspect of great health, and which, when rubbed off, presently appears again. It is an exudation from the glands of the stalk, and is the same kind of matter that in others, where it is more tough, and easier hardened by the air, forms hairs, or a downy covering; making what the botanists call hairy or woolly stalks.

This light covering of the stalk had fallen off entirely in the crop of pease, when they grew weak, but it was restored to them now they were strong again; and the owner who knew very well its importance, was easy, as soon as he saw it return. The event answered his expectation, and the crop blossomed very finely, and produced abundantly.

This was a very imperfect method of breaking the ground, in comparison of that which is proposed by horseshoeing, in the intervals of crops planted at a due distance for that operation; but it shews the truth of the proposition on which that practice is founded, namely, that breaking the ground, and tearing it up with a new surface, not only affords more nourishment to the plants, but absolutely answers the purpose of watering them. Perhaps indeed this is one of the great articles by which the fresh breaking of the ground becomes so exceedingly serviceable to the crops; for there is no doubt of the great service of moisture;



which they by this means receive while they are growing; and the ground being at the same time turned up about their roots with a loose and fresh surface, the moisture which they receive must come to them impregnated lightly, with the lightest part of the mould. This gives a double force to the practice of horseshoeing; and we may the more easily believe from reason, what experience will afterwards shew us, of the vast benefit which is always the immediate consequence of this practice. It is owing to this, that light lands are found to receive most benefit from it; for light lands are most apt to hurt their crop by drought, the moisture which falls on them not only evaporating sooner, but in many of them also running through the ground, where the under bed is loose. All lands will receive great advantage by the breaking of the surface, while the crop is growing; but the lighter they are, and the dryer is the season, the more will be the benefit arising from this practice.

When pease have been assisted by this method, about the time of their blossoming they will produce fruit in such quantity, that there will require a particular care in the managing them after they are cut.

The farmers find that the larger the bundles are, in which the pease lie upon the field, the more apt the pods are to burst and shed the seed, especially if there come wet while they lie out. The following cautions will be very useful. The richer the crop, the smaller should be the heaps in which they are laid, because the quantity of pees will be greater, in an equal quantity of this richer crop. It will be very plain also, for the same reason, that the more rain there falls, the oftener these heaps should be turned; and indeed, in very dripping seasons, they should be divided again each into two smaller heaps. Pease get this mischief by the wet lodging upon them, and by the damp vapour rising from a whole large and wet heap. For no quantity of rain which fell on the pods, and run off again, would take any such effect.

There is another bad consequence of the pease lying wet in large heaps, which is, that the pease within their pods are spoiled even before they shed: for the damp penetrates through, and the mealy substance of the pea very readily imbibes and retains it, a fermentation is brought on by this, and the mealy part is hurt irreparably, or perhaps utterly destroyed before the other accident of the bursting of the pods happens. I have seen many very rich crops of field pease destroyed by this accident; and what makes it the most injurious, is, that the best and richest suffer most by it. In a poor crop, where the pods are few, the pease in them but half fed, the lying exposed in very bad weather shall do little hurt, for the hard substance of the pea, and the toughness of the very fibres of the pod will prevent the moisture from corrupting the one, or bursting the other: both these accidents being the consequence of swelling of the substance. Whereas the tenderness of a full pod, and large pease, lay them open to the mischief; and the same exposure to the weather, which would do no hurt to the poor crop, will split half the pods in this rich one, and shed the pease; and will spoil those in the other pods, though they are kept very secure in their places.

#### C H A P. CXXIX.

##### *Of the signs of a healthful pea crop.*

**M**R. Lisle, who has made many useful observations, and recorded them with truth, though he be not very happy in his reasoning upon them, observes, that the closing and opening of the leaves of pease shew the degree of coldness in the nights. The fact that leaves do draw together, and close at evening, and expand again in the morning, is certain; but the cold has nothing to do in this appearance. And though it be of no consequence in this frivolous light of determining the degree of cold, it is a very important sign of the health of the plants, and always should be regarded among others; as it will shew when the crop thrives, and when it wants assistance.

The leaves of all plants which have many upon the same foot stalk, draw together at night, and spread open again in the morning, when those plants are in health: and the readiness they shew in these voluntary motions, is a proof they are healthy. Pease and vetches, and indeed the whole pulse and clover kinds, when they are strong and flourishing, begin to draw their leaves together two hours before sunset; and do not open them again till as long after sunrise in the morning. During all the night, they are kept closed together, and this is called the sleep of plants. It has effect only in such as are growing, for it is a part of their principle of life; and while growing, the strength of it is always proportioned to their degree of health.

Therefore if the farmer sees his pease keep their leaves expanded till sunset, he may be sure they are not in a vigorous state of growth; and if he sees them open, even at the approach of darkness, he may be sure the crop will come to little, unless he gives it good assistance by dressing or manure. This is a plain reason why pease should always be sown in rows, with spaces between them: they frequently want assistance, and when they grow in this manner it is easily given them; but in the promiscuous way it is impossible. The farmer may be assured it is worth his while to give them this help, when they appear by such evident signs to want it, because the consequence will be a very poor, or a very good crop. This is in his choice; for as no plant droops more readily than the pea, when it wants due nourishment, none receives it so freely, or shews such immediate signs of the advantage.

It is at the flowering season, and at the setting of the pods, that the assistance the farmer can give is usually wanting; and there are no surer marks than those Mr. Lisle has mentioned of the plants wanting it: these are the falling away of that light dust on the stalk, and the not closing of the leaves at evening.

As to the cause of that motion in plants, and the prognostication of cold or heat from it, we are now better acquainted with the source of that real appearance, than to regard them. The only cause of the closing the leaves, is the approach of darkness; for the only cause which keeps them expanded is LIGHT; and they are always expanded in proportion to the degree of light. They begin to close before the cold of the evening comes on, for it is as soon as the sun gets toward the horizon; his light being then less, because of the vapours through which it is sent to us: in the same manner, in cloudy days, the leaves are less expanded than they are in bright and fair ones; and the farmers of an earlier time were more right, who presaged rain from the closing of the leaves of their clover, than this late observer, who attributed the effect to cold.

The matter has been tried by repeated and careful experiments; and it is found, that plants of all countries are equally subject to it: and that the want of light is the only occasion. The plants of the East Indies, preserved in our stoves, answer to these experiments in the same manner, as the pease in the fields; and it is plain, that in these cases the differences of heat and cold can have no power, because the heat is the same day and night in these stoves, and is kept to the same degree, even by a thermometer. All the plants of those countries which have winged leaves like the pea, or trifoliate like the clover, obey this law in nature; and whether they be more or less watered, their leaves close at evening, and open in the morning in the same manner. Therefore neither heat or cold, moisture or dryness, have any power in this matter, provided the plant have enough of each to keep it in a state of health, and there is no other cause but light. Even the sensitive plant so long admired, and so little understood, is subject to the same law: and only differs from the rest, in that it is more delicate. The leaves of that shrub close at the approach of night, as they do upon the touch, and open again in the morning. This has been explained by many instances, and illustrated with various examples, in a treatise entitled, *the sleep of plants explained*; and it is our province, in this place, to shew the use that property in plants may have in directing their culture. As light has this effect upon all the plants of the farmers crops, which have leaves of the winged or trifoliate kind, he may know by it what is their state of health: and by a careful observation, he will learn from this the first appearances of their disorders.

It has been supposed, all plants, except the sensitive, were destitute of motion; but we see these all have the same kind of motion, though from a different cause, and in a less degree. As motion is the extremest perfection of the vegetable life, it requires the perfect state of the plant, in order to its being well performed: the least decay in the health of the plant weakens this power; and at length, if the plant is about to perish, it is utterly lost. Therefore the degree of health may be always known by it; and the first symptoms of a plant's sickness, will be seen in the defect of this motion.

The farmer will soon perceive the truth of this, if he will look out into his fields of pulse and clover, which are in good condition, at noon, in the afternoon, at night, and in the morning. The curious who have stoves, will see it most distinctly in the sensitive, the tamarind, the abrus, and the coral tree. And if they are desirous to be satisfied that light alone is the cause of this wonderful effect, they may see it by removing any one of these in a pot from light to darkness at their pleasure. The leaves will close in half an hour, if the plant be set in the dark



at noon day; and they will expand so fast that it may almost be seen, when they are brought into the light again.

In a bed of garden pease, whereon the experiment has just now been tried of keeping them without water, and that in a light soil, the first appearance of their being sickly was observed in the upper leaves losing this power; and when all the other common symptoms of weakness had followed, the crop was recovered just in time by watering, and the power of motion in the leaves renewing itself gradually as the plants strengthened themselves, shewed exactly the state of their health, and progress of their recovery. There is little merit in philosophy, except it can be turned to use; and these experiments of naturalists are always frivolous, unless they can be applied to some good purpose. This evidence of the health of plants is plainly one instance, that what appears mere curiosity may have its important use; and it would be happy if some farther enquiry into these subjects, would give us tokens as evident, and as early of the decay or distemperature of the corn kinds. We find when those valuable crops are starved, by the change of colour in their leaves; but it is then sometimes too late for any real service; and at the best, when our care can restore the crop to health and vigour, there has been a check in the growth, which is never perfectly overcome. Now in the pulse and clover kinds, this want of vigour to close the leaves is a more timely notice. The leaves in all these plants will after this fade and decay; but the happiness is, that we have notice of the danger in better time: and when it is seen so early, it is easily prevented. The diseases of plants are so far like those of animals, that it is much easier to cure them in the first approaches, than when they have confirmed themselves by time.

#### CHAP. CXXX.

##### *Of the benefit of tares upon a stiff land.*

**A**LL the pulse kinds improve land by the particular manner of their growth, which is the spreading out very much into stalk, and rooting very slightly. Their stalks also lying upon the ground in part, and their leaves being numerous and large, they shelter the surface, and mellow it to some depth: this is the benefit the farmer expects from them, beside the present hope of their own produce; and for this purpose two things should always be in his mind when he sows them: these are, 1. What kind of ground most wants mellowing; and, 2. What manner or method of sowing them will best answer the purpose.

The grounds which will get most by being covered and sheltered, are those which are naturally the most tough and firm; and the method by which they will be most mellowed, and least exhausted, is by the sowing the pulse in rows at such distance, that the haulm, when well nourished, will spread itself over from one row to the other. In this case the intermediate surface will be well shaded, and the plants not spreading their roots far any way, the whole will be little exhausted, and those intermediate spaces scarce at all.

When the farmer has settled within himself what piece of his land will receive most benefit from this kind of growth, let him consider next what kind will most suit that piece, and best cover it. These particulars often depend upon very small circumstances, but an attendance to them is the more needful, because all the preference of one kind to another depends on them.

In regard to the ground, whatever piece lies most exposed to the sun, will receive most good from this kind of shelter, provided the crop be well chosen for that situation, and the ground have that toughness, hardness, or firmness, which make the pulse crops most beneficial. When the enclosures are small, the trees in the hedges high, and the soil itself not of a very firm nature, pulse will give no improvement, because the shade and shelter of those trees, and the natural quality of the ground, will have kept it all along in that condition, whereunto it was expected to be brought by such crops.

In fields which lie open, though they be sowed ever so properly with pease, if the ground be naturally loose and crumbly, they will get very little advantage. This points out the kind of soil and situation where most good will be obtained by the crop of pulse; and in general that kind will do most good, which lies longest on the ground. Therefore the most advantageous of all these are the winter vetches; and the greatest benefit that can be obtained by this kind of culture, is preparing ground for barley.

If the husbandman have a piece of hard clayey land that lies high, and has little shelter, there is no method so ad-

vantageous as the sowing a crop of the winter vetch, for the mellowing this ground for summer corn. He will receive a very considerable advantage from the crop itself, for the produce of the winter vetch upon such a well wrought land, will be very great; and he may, without any other preparation, work that ground in the spring for barley. But if he should place this dependance upon a crop of the very best pulse in a looser soil, he will be disappointed; for such ground does not want the mellowing for which those crops are so valuable, nor does it receive the advantage from them. In this case the barley will come to little, unless there be a farther preparation of the land; and this is best done by folding sheep upon it.

Some prefer pease to the lesser pulse; for this mellowing of ground; but there are many objections. Pease are not so hardy as these kinds, and therefore they cannot be used like them on all soils. Then beside their lying a less time upon the ground they root deeper, and exhaust the land much more, as they require a larger quantity of nourishment for their more abundant haulm.

A third reason why the winter vetch is vastly preferable to the pea, is, that there is a great quantity of a very rich juice secreted in the stipule, or little films, at the joint of the stalks, which is of vast service to the ground. This is a kind of abundant nourishment, which is prepared for seeding the flowers; but as the plant does not want it, it is sweated out upon the surface, and the next rains wash it off. This is one of those substances which immediately bring on a fermentation in the mould, and being received into the present soil, at a time when it is shaded, and kept mellow by the drooping stalks of the vetches, it operates in the full force; and the ground is enriched by it in such a manner, that the particular spots on which it has fallen, might be used as a manure for other land. These in the subsequent plowings become thoroughly mixed with the rest of the soil; and that being all rendered lighter and hollower by the overhanging of the crop, is ready to receive it, so that it is immediately put into a state of fermentation, very favourable to the growth of the new seed.

This is a reason not enough understood, but it is of great weight and force; and it is one cause why vetches are preferable to pease; for the mellowing and preparing of land.

Winter vetches have not the quantity of haulm or stalk that summer ones of the same kinds have; and if the same species be sown for a winter, and for a common crop, the stalks of the latter will be much the larger and longer, but the growth of the stalk often starves the fruit. The longer the summer vetch continues encreasing in the haulm, the less is to be expected from it in pods; for the nourishment is wasted in the stalks and leaves, which should form flowers, and fruit. It is observed, that when a crop of vetches continue growing in height or length of the stalk late in summer, the approach of the cold weather always sets them to fruiting, by stopping the growth of the stems; and for the same reason, the winter crops do not run into stalk so much, and consequently bear more fruit.

#### CHAP. CXXXI.

##### *Of swards upon grass ground.*

**I**T is a common error to leave the grass somewhat high, at the time when the grounds are laid up for hay, though that be early in the season; and the vulgar opinion is, that the crop of hay will be larger: but this is found now to be a very erroneous and hurtful practice. The hay neither is, nor is expected to be the produce of those blades, which are left from the eating, nor has the length at which they are left any effect in the success of the succeeding growth, unless to injure it. The most advantageous method is to have it eat down close, but to do this in good time: then the roots making a fresh shoot with vigour, that is carried up uninterrupted in its growth for hay, and no blade nor stalk but answers to the scythe, and makes good hay.

In this case the dung, the urine, and the sweat of the cattle which feed upon the ground, all help to the nourishing of the roots; and when they are taken off from a well eaten land, the whole that is to come will be the produce of roots they supplied, unexhausted by other growth. The last days of the seeding will also do more good to the ground than any other, because the surface will be bare and open to receive the dung and urine; whereas when the growth is higher, they lodge upon the grass, and a great part of their virtue is evaporated. This is the practice which reason directs, and the farmer who follows it will find, at the time of mowing, that every blade,



as well as every stalk, cuts through with the scythe, and all is of a length and condition for hay.

On the contrary, when the cattle have been taken off, before they had half eaten the grass, and the old blades remain five or six inches high in many places, the ground will not have had the full benefit of their dung, nor will the roots be in a condition of their best growth.

When only the stumps are left close to the ground, they presently decay, and the whole covering of the ground is new and young grass; but when the remains of the leaves are five or six inches high, they retain the power of suction from the root; and though their grown ends remain in the same state as they were left, and the blade themselves get no increase in length, yet they continue alive, and take up the place of other grass; and in the mowing time, not only reduce the quantity of hay, but hurt the after-math.

The mowers know them to their vexation, for they make the work very unequal and troublesome. In the mowing a part of them are cut off with the proper grass, but they are only short ends, and are lost in the making: when the dew is off, they bend before the scythe, and it passes over them; and when noon comes, and the rest of the grass has a firmness which just supports it for convenient mowing, these old blades become hard, and perplex the work, blunting the scythe. There is no good in these long remains of the old grass at the best, and they are in many respects very troublesome. The quantity of hay is the less in itself; and it is rendered still less in quantity, by the raising of the scythe, when this is hardest, so that an inch is often lost: and the after-growth is poor also in proportion.

It has been always known, that eating down a grass crop made it grow the more, and this was attributed to the dung of the cattle; but beside this, the very cutting down the old stalks makes the new shoot up more vigorously. When a farmer has been so ill advised, as to leave some part of a pasture standing, because it was thin when he was mowing the rest, the consequence has always been, that it has been afterwards the thinnest and poorest piece of the whole ground. He has not only deprived himself of so much hay as it would have yielded, but has prevented the growth of the succeeding crop.

The common practice of gardeners, in the frequent mowing of their grass walks, might have taught him better. It is a constant and certain observation, that the closer and the oftener they are cut, the thicker the grass grows; and the consequence is the same in degree in meadow ground, for nothing encourages the thick and regular growth of the grass, like regular and close mowing.

It is a custom among the farmers about London to agree by the acre with their mowers, because as they generally come strangers, there is less dependance upon them for an honest day's work: but unless the husbandman himself follow them at every step, the dependance upon their doing their work well is much less; and he had much better pay by the day than by the piece. If he will agree in this manner, and follow them also at times, they will observe his direction to cut close to the ground, and he will be many times overpaid by the addition of so much to his hay, while he is also at the same time securing a better growth for the succeeding season.

This holds true equally of the artificial and natural grasses; and the same directions will answer the same, or indeed greater purpose in the mowing of saintfoine, lucern, and all the other plants, the succeeding growth always comes up the thicker; and the more regularly, the better the management has been in this respect. In common grass it always does, and always must come immediately from the root; but even in the artificial grasses, when the fresh growth is often made from the remaining stalk, this is best done, the shorter that stalk is left. When that is of considerable length, a certain number of shoots rise from it in those places where the other leaves have grown; but the more there are of these, the fewer there will be from the root; and it is those from the root on which the husbandman may place his greatest dependance. When the stalks are cut close, the root sends up a great number of new ones, and therefore the way to make the succeeding crop thick, is to cut the present one close. It is the same in eating down the crops, unless when they are young, for at that time the roots are very easily damaged, otherwise the closer they are cut down, the better the dung and urine of the cattle gets down to the roots, and the better the warmth of the bodies of the creatures nourishes the ground. The crop will rise free, because there is less of the old stumps to interrupt it; and the roots will have the more vigour, because of the immediate course of the manure to them.

Gardeners, when they cut down the stalk of a perennial plant, cut them close, because they know it is fitter the new shoot should be from the root, than from the side of the old stump; and we have said on many occasions, that what is right in the garden, is right also in the field. The nature of vegetation is the same, whether it be carried on with more labour in a smaller spot, or with less in a larger; and wherever it is possible to introduce the management of the garden into the field, it is advantageous to do it.

## C H A P. CXXXII.

### *Of making malt.*

**W**HETHER the farmer make malt for his own use, or for sale, he should attend the operation with the same care. There is a seeming advantage in obtaining an increase in quantity, but it often costs more than it is worth. There will naturally be some increase, because the barley swells in making the malt; but if this be managed purposely for an increase, the farmer will deceive himself extremely. He may easily have such an advantage as a bushel and half for the quarter; and with the management we direct him to avoid, he may have even two bushels: but he should know that this is not real; and that if he come to use the malt himself, it will make no more beer for this advance in quantity; nor if he carry it to market, will it produce him any more money. The cleanness of the malt is a great consideration in the market price; and this will soon bring all to the same condition. A very small reduction on account of foulness, will run away with more than the intended benefit, and in general they who abate for a bad quality in the commodity, are expected and obliged to abate largely.

When the maker finds more than a bushel and half increase in the quarter, he may reduce the difference to less than a bushel by good cleaning, and this will always be so much gain; for the difference in the price between a quarter of clean and of fouler malt, will be more than the price of the half bushel.

Often those who design themselves this advantage of the largest increase in quantity, find they are reduced in the thing itself; for the increase depending upon what they should have separated, that small quantity will be lost in the necessary moving about of the malt afterwards; and when it comes to be measured again before use, it will not answer to the quantity for which it was sold, nor will the buyer be content with it, because the reason of the increased measure is very plain. The seller must either refund so much of the purchase money, or pay, what is dearer, so much reputation.

It is observed, that the beer brewed with pale malt is neither so strong as that with the high-dried kind; nor will keep so well: but experience shews this is not a fault in the nature of the malt, but in the manner of managing it. For under the name of drying it pale, they do not dry it enough.

Pale malt may be as fully dried as brown, and will in that condition be harder, because it will be dried without scorching; the effect of a scorching fire being always to make the substance brittle. When the pale-dried malt has length of time sufficient allowed it in drying, the whole becomes very thoroughly done, and is hard and firm. And in this case the beer that is made from it will be stronger, than what is made from an equal quantity of the common high-dried malt; and with the common advantages will keep longer. It is not the great colour of beer which denotes its strength; for the brewer very well knows this is owing to the scorching of the malt: the soundness and body of the liquor will shew it, in beer that is scarce coloured, for the substance of the malt may be in the palest beer, in the most full perfection. The way to know the absolute strength, is to take care the malt be good, and then compute the quantity.

In the making of malt, a great deal of its value, and of the strength of the beer to be made from it, depends upon the absolute degree of malting the grain. We know the change that must be made in the flower, in order to the change of barley into malt; and if any part of the grain be not changed in this manner, it is so much loss; for that part which is not made, will be of no service in the brewing. The barley, in its natural state, would not make into beer, nor will any more of it than is malted properly and fully: all that part of the flower of the grain, which remains unaltered, will be useless in the brewing.

There is a mechanical method of knowing when the whole is made properly; and it must be of the greatest use to the malster to observe it. The spire of the grain shoots one way in the malting, and the fibres that would make the



root another. The spire must be as high shot up within the rind, as the fibres are pushed the other way, or else the grain is not malted. The alteration of the flour or meal of the grain, keeps pace exactly with the growth of this spire: and so far as that is shot, it will be found to be malted, and no farther; therefore the examining this spire will at all times shew the state of the malt: for so far as it ran, so far the natural meal of the grain will be converted into the nature of malt, and no farther. The rest will be useless: so that by the ill management of the malt in making, the brewer may be deceived extremely in the strength of his beer. He calculates that so many bushels will make so many gallons of such a strength: and supposing this to be a certain point established upon firm experience, his succeeding brewings may deceive him, if made with a malt that is thus imperfect, for if only one fifth of each grain be left unmalted, his beer will be certainly one fifth weaker, though all the same care and pains have been taken in the brewing; and the same quantities of all the ingredients have been used. Long custom teaches the wholesale brewers to judge of their malt with great exactness; but in private families no deception is more easy than this. Such malt as is thus imperfectly made, will look very fair to the eye; and perhaps the buying it a very little cheaper, may influence the person; the seller allowing a small abatement, because he cannot impose it upon the larger purchasers. In this case, one fifth or more of the malt is useless, and the cheap bargain, as it appeared, will prove a very dear one: for the beer will not have its proper strength.

In the same manner, when malt is made at home for the use of the family, if it be imperfectly done, there is a certain part which is of no use or value: and though all appeared good, the beer is much too weak for the allowed proportions. The method we have given to judge by the shooting of the spire, was first communicated to the author of the before-quoted observations, by an honest malster; and it will never deceive. It is owing to the overlooking, or not understanding these slight appearances, in the malting and brewing, that the beer of private families is in general so much inferior to that of brewers. We have shewn before, how much it is to the interest and advantage of families to brew for themselves; and we hope they will perfect themselves in the practice, by attending to these instructions.

The method of trying malt, by throwing it into water, is very well known; for what is good will swim. This shews the change that is made in the grain; for, on the other hand, when the farmer is trying his barley for seed, he makes the experiment by water, and he finds it sink. In the choice for seed, all is bad that swims upon the surface; and in that of malt, all is bad which sinks. But there is a farther use in this experiment that they make, who are nice in their observations. Malt swims on the surface of water; and when it is perfectly made, it swims in a peculiar manner: let this be observed; and it will be found, that such as is imperfectly made, though it swims, does not keep the same position on the water. This depends upon a very plain principle: if it be imperfectly made, some part of it is in the condition of the barley before making: we mean some part of every grain; as the portion of the meal, for instance, which is beyond the end of the spire, according to the trial before directed, of the malt in making; this part of every grain will therefore be heavier than the rest, and consequently the whole grain cannot float on the surface of the water, in the same regular manner wherein the grains of that malt will, which is perfectly and thoroughly made. A handful of the malt in a basin of water, will at any time make this experiment; and there are so many reasons for brewing at home, that every article should be added that can be useful to the perfecting the knowledge of it. In general, when a brewing miscarries, the fault is laid in the wrong place; and unless it be understood, it never can be amended. The imperfection of the malt is oftener the case than is imagined; and the examination into the cause of miscarriages should be begun. Therefore it is in vain to quarrel with the water or the hops; the time of boiling, or the manner of putting them in, when the real fault lies in the principal ingredient itself, which a strict examination should have discovered, and which nothing can amend.

Among the various kinds of mixtures which have been made with barley for malting, that of oats, when properly proportioned, and rightly managed, succeeds by far the best. The ill success of many who have tried this mixture, has being owing to their not understanding the right proportions. One bushel to six, eight, or ten, has been a proportion tried by many, and various accounts have been given of the success of mixing oat with barley malt, by

those who have made these trials, each speaking in absolute terms, as if the particular proportion he used were the standard measure; and all mixtures of barley and oats would succeed accordingly.

Upon a careful enquiry into the effects since the publication of the preceding volumes, it appears, that when the oat is mixed in a smaller proportion than one eighth, it has no sensible effect upon the beer; that from one eighth to one fourth it gradually diminishes the strength of the beer, but without giving it any particular quality; and that in the proportion of two parts barley malt, and one part oats, the brewing will afford a very pleasant drink, worth the consideration of all country gentlemen.

It is said, that in many places a custom begun in Hampshire is now prevailing, which is that of sowing an equal mixture of barley and oats to raise a grain for malting; but by what we have seen, and according to all we have been informed from those who have made the trial, the proportion of two barley to one oat, makes the best drink, and in this proportion we have found also that these two grains will grow most favourably together. These are reasons why this proportion should be recommended to all who are disposed to try this pleasant and wholesome kind of drink. It may be, that though this proportion is better than any other yet directed, future trials may prove that a little addition to the one or other article, may be still better: this subsequent experience alone can shew. We propose what appears upon the experience we have at present to be the best; and we may with perfect truth assure the reader, that this is worth his notice; if he will afterwards try small variations, he will inform himself perfectly what is the best of all.

#### CHAP. CXXXIII.

##### *Of the oak bud.*

WE have given the former cautions relating to the poisonous and hurtful plants and trees which are natives of this country: and have added to the account, whatever kind experience or undoubted authority has shewn to be of mischievous qualities. It was with surprize we saw, in the observations of Mr. Lisle, an account delivered upon his own authority, that the oak was to be added to this number. This gentleman gives the fact upon his own experience, and affirms, that having lopped some pollard oaks of his own in spring, a number of cows were killed with feeding on them. The fact was of so much consequence, that we have endeavoured to see it ascertained or refuted by farther experience; and this season cattle have been tried with a few leaves of the oak. They are not fond of eating them; and when they were induced to it by mixing them with other things, some disorders have followed. Cattle which had browsed some small wood also among which there was oak, which they gnawed with the rest, fell into disorders, from which they were difficultly relieved.

The season of the oak being in bud was past, so that the exact trial could not be made: but it is very probable what this gentleman writes is true: for the buds of many trees contain a much stronger juice than any other part; and we have seen that the leaves, at a more advanced period, bring on diseases. The buds of the tree which we call *tacamahac* in our gardens, are covered with a very strong and fine scented resin, which is not to be found in any other part of the tree, in any thing like that quantity; and the same observation may be made in regard to many others: if this be also the case, in respect of the oak, it is not very wonderful that the buds should be absolutely fatal, when we see the leaves are very pernicious. Cattle are not fond of them while growing, but it seems that they will gnaw them greedily as they lie to dry; therefore they should be kept out of their way in that state. The usual and natural taste of the oak is austere and rough; but I have observed, that a kind of honey juice sweats out of it in the lying, after it has been a few hours cut. Manna in this manner sweats out from several shrubs and trees; and it is not improbable that this sweetness may tempt the cattle to eat the buds and tops of the branches, which at another time they would not have touched. The disorders which came on in the cattle which eat the oak leaves for these trials, were heat of the flesh, difficulty of breathing, and costiveness. They were relieved by the gentlest of the methods in the preceding volumes, where we have treated of severities and costiveness of cattle. Indeed it is probable that most of the diseases of cattle, which we are apt, as well as the farmers, to attribute to very different causes, proceed from their eating unwholesome herbs, from which nature does not in all cases preserve them. It is found by this example of the oak, that they will eat a thing, though improper for



them, in one condition, which they will not touch in another; and we have observed on a former occasion, that they will eat those very poisonous herbs in a fresh ground, which they would have avoided in the places where they were bred.

#### C H A P. CXXXIV.

##### *Of spring lambs.*

**F**requently the ewes in early spring have not milk enough for their lambs; and sometimes they are of so untoward a disposition, that they will not permit them to suck. In this case the farmers resource must be the feeding them with cows milk; and with a little management, this will succeed extremely well, though for want of care and attention, many have given it up as a thing impracticable.

The common accident is, that the cows milk runs thro' the lambs, without affording them due nourishment. This

is owing partly to its being too thick, and partly to its wanting that astringency, which is in the natural milk of the ewe.

It is the natural constitution of the cow to void her excrements thin; and of the sheep to have them hard and dry: and the original of this in the calf is naturally from the cows milk. This therefore, if it dispose the intestines, and nourishment of the lamb in the same manner, throws it into purgings. To prevent this, the following method has been found effectual.

Boil a quarter of a pound of tormentil root in a gallon of water, let it keep boiling gently a quarter of an hour, then strain the liquor. Mix one fourth part of this with the milk that is given the lambs; and it will reduce it to a proper thinness, and take off its purging quality. The lambs will feed upon this as well and naturally as on the milk of the ewe.



## T H E

# HUSBANDMAN'S KALENDAR,

## O R,

**DIRECTIONS** for the care of his land and his stock, according to the twelve months of the year.

### M O N T H   T H E   F I R S T.

#### J A N U A R Y.

**T**H E farmer's great dependance is upon his wheat crop; therefore let that employ his first care. When he has had the common advantages of getting it into the ground in September, October, or November, it will be now in its natural condition of growth, and will require no assistance from him, except the care of his fences for protection.

When it has happened that he could not sow his wheat crop in these most advantageous months, let him do it now. I have seen good crops from a January sowing, though very rarely from those of December: for in that case the frosts have so much power over the first shoot, that they often destroy it.

Let the farmer observe this caution. Even January is too early for successful sowing in open fields; but in warm enclosures it succeeds very well. There are two reasons for this: the crop will be endangered in the exposed ground, while in the first shoot; and it will be late ripe for harvest. But it is not so in small, warm, and well sheltered inclosures: the young shoot is defended there, and the crop comes forward.

For this sowing, the ground must be extremely well broke by the tillage; and the seed should be buried a little deeper than at other times: it will lie warmer, and the first sprout will be more out of reach of frost.

The drill husbandry is much more proper for sowing wheat in January, than the common method; because by that every part of the seed can be lodged at a proper depth.

A piece of wood-land intended for tillage, will be very proper to sow with wheat at this time. If the ground be cleared by the middle of January, the crops will come up sufficiently strong, and answer very well.

Those parts of the land which are intended for spring crops, should now be turned up deep with the plow, and thrown loose on the surface. The succeeding frosts will break and mellow the soil; and it will be in excellent condition for the preparing for seed time.

Lay on manures that require the frost and rain to break them; and yet must not be exposed too long upon the surface. Soft chalk, and the shelly marles which fatten land, very speedily, may now be laid on; and they should lie three weeks before they are plowed in. Common chalk,

and the hard or tough clayey or stony marles, require more time.

Plow up clay and other tough soils twice in the compass of this month; and if any thing of the sandy kind have been added as a manure, let this season of plowing be the more strictly observed: the frost assists greatly in loosening the surface of the clay, and letting it into the land.

Old dung may very properly now be brought upon the land, that is to receive a spring crop early. It may lie without damage a fortnight before it is plowed in, or longer, if the weather be unfavourable.

Clear pasture grounds from stones, sticks, bones, and other kinds of rubbish, which have been brought on by accident, or with the manures, and would hurt the crop, and disturb the mowers. These things are easily seen at such a time; the ground gets no damage by treading, and labour is less wanted on other occasions.

The weather must in a great measure direct the husbandman where to employ his labour this month. If the frost be severe, he must attend principally to the management of his pasture ground, because the land in tillage will not admit the plow, or other implements. When it is mild, he must employ himself in the tillage articles: and the more mellow and rotten his dung is, the better: grass ground being of different soils, admits with advantage a diversity of manures.

Where the soil is a fat loam, or a loam with a very large quantity of mellow earth among it, the best of all manure is old dung and pond mud mixed together. This may be considered as the general manure for these grounds.

The most favourable time of laying it on is now in the middle of winter, that there may be frost to dissolve and break to pieces the harder parts, and that the rains may wash the whole into the ground, while there is no great power of sun to evaporate the virtue of it as it lies spread.

The way of laying manure upon grass ground, is to drop it in small heaps at due distance; and first employing labourers to break and spread it well by hand, afterwards have it worked over with a bush harrow.

This harrow is to be lightly drawn to and fro about the ground, till the whole quantity of the manure be torn to pieces, and spread over the place; it will then be soon buried.



ried among the rising shoots of the grass, which will grow up apace from the effect of its enriching quality, and what remains will have time to get thoroughly well into the ground.

Whatever dressing we order to be laid on grass grounds, this, so far as its nature allows, is the manner of spreading it.

Where the grass ground is very poor, this is a good time to lay on manure. The most common is dung: a week after this it will be proper to go over the ground with a roller. The weather will have softened the dung in the mean time, and this, pressing it flat to the ground, will prevent that little evaporation which might happen from the winds, and render it the more ready to be washed into the soil.

Look to every part of the ground where water may lodge, and see that the drains keep in good order. There is no time when the lodging of wet will do more harm. The roots cannot bear it, because they have less vegetative power than at other seasons; and it gives the frosts more power.

Wherever there is any lodgment of this kind, see whether it be owing to the filling up of the old drains, or to the want of more effectual ones. Open the old, or make new, according to the occasion; and see that every part of the ground has its discharge before you leave it.

Next look to the field of artificial grasses.

If the farmer have young clover in a field, that has loose soil, let him look thoroughly to its condition, both in the leaf and at the root. If the plant appear weak, it is most probable the earth lies loose about the roots. In this case, let him take the proper opportunities of turning in his sheep upon it. They will feed upon the plants, and warm the roots with their dung; nor is this all the advantage.

The damage that the severest winter can do to clover, is not very great, if the roots be tolerably covered: if the soil lie any thing close about them, they will get no harm: and for that reason when the farmer finds danger of the winter, with respect to a young crop of clover that is alone, his best method is to turn in his sheep to eat it before the approach of the severe season. The leaves and stalks which would have been perhaps in a great measure destroyed by the frosts, and long lying of the snow, will have answered their purpose, and been eaten; and the root being better secured than before, by the trampling of the cattle, which fixes the ground about it, will stand perfectly well: and having no head to support during the winter, it will send up its leaves and stalks vigorously in the spring.

This is a season also at which sheep may be very properly turned into a field of young saintfoin.

The feeding upon the saintfoin ground is an excellent thing for cattle: it is full of a rich nourishment, and yet not rank. It fattens them, without breeding disorders. Spring is the season when it best answers this purpose, and this is most convenient to the farmer: the only caution he need have in this respect, is not to put heavy cattle upon it in wet weather: in any other season, when the crop is well established, they will not be able to hurt it; but their feet in such times will do some damage.

Spring is the best season for feeding large cattle upon it, and the autumn and winter are the most proper for sheep: this very well answers the farmer's purpose. The great shoot of the spring is sufficient for the cows and oxen, and the crop recovers itself sufficiently for one mowing, after which there grows a young shoot that serves very well for sheep, at a time when they want it; and they neither damage it by their close eating, nor by their heavy treading. No food fattens sheep so freely or so suddenly at that season, and none is better for oxen in spring, or for milch cows, when eaten upon the ground, or green in the rack: it causes abundance of milk, and does not give it that strong and particular flavour it has from the feeding on clover.

The general cautions we have given must be enlarged or retrenched, according to the soil and other accidents attending the crop. In a dry soil and dry season large cattle may be turned in upon the growing crop, earlier than we have said; and on the contrary, in a moist soil they must be kept out later. Nothing establishes itself more firmly in the ground than saintfoin, giving it time; but when it is trampled upon young, in a damp ground and wet season, it is damaged in such a manner, as often never to recover it thoroughly.

Select a proper spot of ground for a crop of lucerne. We have, in the preceding sheets, given a full account of its value; and the husbandman will find nothing is more to his advantage than raising it. He must choose a piece of warm land that lies high. A dry loam is the best soil; and if there be a mixture of gravel, there is no disadvantage.

This must be prepared well by deep and repeated plow-

ings, and turned up to the air to be impregnated by its power during a long fallow.

See that the hay of the artificial grasses keep dry, sweet; and in good order, it will be of excellent service now for the cattle; being richer and much more nourishing than any other kind.

If clover be at any time in danger from frosts, when it is sown among wheat, and is yet young, from the earth, mouldering from its root by the frost, the corn itself will not be secure in the same place: and one method will be advantageous for both; the roller properly introduced and carefully managed, will press down the earth without hurting the plants. The crumbly soils are most subject to this mischance; therefore let him look particularly to these at the present season.

Gardeners often find that the frosts throw their young plants up out of the ground. Whatever happens there, may also in the field; and the careful eye of the farmer is required to remedy the evil.

Look to the field of TURNIPS; and see which will be fittest for seeding upon the ground, which for drawing. Both will do excellent service; for it is a season when all kinds of cattle want good food; and when there is little of other kinds for them.

When they are to be eaten upon the ground, let cribs be set up for the holding of dry meat; and in those fields where they are to be drawn, let the largest be taken up from time to time, and the rest thin'd by this means. The common practice is to begin at one corner of the field, and clear as they go; but it is very wrong. There is no season when roots do not gain something in the ground; and in the way we direct, while a part are eating, the rest will be improving: for the pulling up a part of them, is a kind of tillage for the rest.

If oxen or cows are to be fattened in the house with turneps, chop the roots small, and give them in a trough, and at the same time put hay, a little at a time, in the racks; the mixture of wet and dry meat is the true method. These cattle will require very little water; nor should they be solicited to drink: the turnep is juicy, and answers the purpose in a great measure.

Milch cows may be very well fed at this time of the year with turneps, hay, and chaff. The common practice is to mix grains with this food; but that, although it increases the quantity of milk, spoils the quality. The other three ingredients give sufficient quantity, and it is excellent in its kind.

The turnep is indeed a food almost universally useful. Horses will feed fresh upon the yellow turnep, and thrive well upon it; and hogs may be fattened with field turneps boiled; and the liquor made into a mash with bran. When they are allowed to feed on turneps in the field, there must be constantly hay or pea-straw kept in the racks, and these should be covered, that it may always keep dry. The sheep will feed partly on this, and partly on the turneps, and it will preserve them from the rot; to which wet food always makes them liable.

If oxen or cows are put into a turnep field for fattening, care must be taken that they do not choak themselves by their greediness. Tho' turneps are an excellent food, they are not a natural one; and not being accustomed to such morsels, they will swallow them so large, that they cannot get them down.

Surgeons, when any thing sticks in peoples throats, force it down with a long piece of whalebone, with a knot at the end; and the farmer must be prepared to do the same kind of service to his cattle. Nothing is so good for this purpose as a dried bull's pizzle, with some soft rag, tied about the end in a knot. When a beast is perceived to be choaking by a large piece sticking in the throat, this instrument is to be thrust down, and it will be relieved in a moment.

Nothing exceeds the turneps for feeding ewes that are suckling lambs, whether in the field or house: but while the ewes are big with lamb, they should not be fed with them. Very bad accidents have happened from it; and not only the lamb has been lost, but often the ewe.

In very hard winters deer may be fed with turneps, but this must be done with moderation and care, otherwise they fall into disorders. We write for the gentleman as well as the farmer; and this is one very important use of turneps in his consideration. Good hay must be given them at the same time; and the turneps must be allowed only in moderate quantity, otherwise they will feed too freely on this watery food, and fall into diseases.

If the planting out of turneps for seed have not been done before, it may properly be performed now. The farmer must choose a mild day for the season, that the earth may work easily; and he must prepare the soil well for them,



them, and not take off any part of the head or upper growth. When they are planted earlier for seed, it is best to take off the top pretty near the root, because the shoot will not be injured; but at this time the head for flowering is formed, and must not be damaged.

Look over fences very well; and where they want repair, or have openings and gaps, let them be stopped with all diligence and attention. This is the season when they are most useful. The cold winds of January will cut off almost any of the tender kinds; and frosts locking up the earth, send all sorts of vermin about for prey.

If there be new planted trees, take care they are not gnawed and barked; and if they want more shelter or defence, give it them.

Look over the coppice wood and timber plantation; pick away dead stuff, and throw it on the dunghill, its value in manure will answer the trouble of taking it up; and be very careful of the hedges round this kind of growth, for cattle in the present dearth of grass, will be tempted to bite the tender shoots; and this is extremely detrimental.

The stock in every kind will require the most care at this dead cold season, that is necessary at any time of the year. They must have shelter as well as food; and the yard scattered over with straw, will very well answer this purpose for many kinds; the dung and urine converting it into manure.

Where they are fed upon turneps as they grow, there must be some good shelter for them against the winds and driving snow; a hurdle thickened with straw-bands, run across the place where they feed, will be a good help, and they will get on one side of it or the other, as the winds change.

If the fish-ponds are covered with ice, let holes be broke, or a small pipe laid in, as we have directed, that there may be air. The bees must be fed, if their own stock be not sufficient for them; and in all these instances, the farmer must not grudge to supply those creatures, which will afterwards supply him.

Let labourers, for whom there is no other employment, be sent out to pick up, and get together manure of various kinds. Horse dung, and the earth impregnated with their urine in the staling places on common roads, mud from ditch bottoms, sheeps dung from the commons, and even the dung of poultry, where there is sufficient quantity about the yard. Let them also be sent out to pick up the haulm of useless growths, and, when the weather will permit, to grub up bushes in the less valuable pasture grounds. These and the like refuse being burnt to ashes, and the ashes mixed with some pasture mould; and the other ingredients now mentioned, will make a most rich and excellent manure.

Turn the dunghills and other heaps of manure. They will get great advantage from the air at this season; and there is no time at which they are so secure from damage, by the dissipation from the effects of sun and winds.

Shrowd the pollard trees, and cut coppice wood; and where there is occasion, fell timber. In all shrowding at these dead seasons, be careful to cut off clean, and leave an even stump; for the wet that will fall cold upon it in this and the succeeding month, as vegetation has little power at the same time, will make its way wherever it lodges; and if the stump be rough, that will detain it, and it will rot that first, and afterwards the whole head. It is want of this care that renders pollards of so little duration. If they were well managed, they would furnish a supply much longer.

The same rule must be observed in cutting wood in general; the bill or ax are the best instruments; and where they leave any jagged surface, it must be cut down to the level smooth and even. The rough work of the saw should also be pared down even, with some one of these sharp instruments.

## THE HUSBANDMAN'S KALENDAR.

### MONTH THE SECOND.

#### FEBRUARY.

**T**HE worst of the dead season is now over, and the farmer will, in a few weeks, have a great deal of business upon his hands. Let him, in the first days of this month, prepare for it.

Let all his land that is to be sown in spring have a good plowing; and if he have any that is sown in the drill method, with spaces for the horseshoeing husbandry, let him now bring in that useful implement. Whether it be corn, or any other crop, let him plow up the middle of each interval alone, not come near the edges of the rows. There must yet be a good deal of frost expected, and this would have too much power upon the roots, if the earth were opened near them.

In the mean time, it is perfectly safe at this season to work the middle of the interval, for this will dispose it to give free passage to the extreme roots, which the first warm weather will make the plants send into it; and in the mean time, it will be improving by the additional exposure to frost and rain.

If any crop planted in the drill way appear weak and poor, let a day be chosen when the frost is not in the ground; and let hoers be sent in with strong handhoes, to work on each side of the rows of the crop, and draw up a quantity of mould about the stem.

This is an advantage no crops can have but those sown by the drill, because no other stand regularly: but it is of great benefit. The weak part of the stalks are covered and defended; and now nourishment is given, the work is very easy, for the ground breaks freely after the frosts and wet of winter, and the benefit is the same that gardeners find in earthing up the stalks of beans, pease, and the like. Nor is the labour limited to this service; for this hoeing clears the ground about the crop from the first shoots of weeds, which would have been very soon called up in a troublesome manner by the warmth and rains of spring; and the feet of the workmen trample in and destroy many others.

This earthing up of the stalks, in a great measure, will save a spring weeding.

In those fields where the rows are so distant as to admit the horseshoe, it will be proper to pursue the same practice. As that implement must not come near the rows, it will be a great advantage to give the plants this assistance by the handhoeing first. The feet of the hoers will have trod down the earth in the intervals, but the horseshoe coming in afterwards, will turn it up light again.

This is a very great advantage in the new husbandry. If a wheat field sown in the common manner appear to want assistance, another method must be used. A light sprinkling of some very rich manure is the only resource in that case.

What I have found most successful is this: some pond mud, pasture mould, pigeons dung, and coal foot. These being mixt in equal quantities, let a labourer early in the morning, toward the end of this month, when there is a prospect of rain, go over the field, taking care how he treads, and sprinkle this mixture in the manner of sowing.

It will give an immediate strength and warmth to the soil; the rains will dissolve, and wash it to the roots; and the field will shew the consequence, by the colour of the plants changing from their yellowish to a deep strong green.

This care being taken of the wheat, in whatever state, let him next consider whether he still wants to put any seed of this most valuable of all crops into the ground. It may yet be done with success under a proper management.

In the first place, wheat can only be sown, with any prospect of success at this season, upon land that lies high and dry; that is well enclosed, and kept in good order. He who should attempt a crop in this way, upon stiff, wet, or low ground, will be certainly disappointed. There are crops enough fit for every soil and season, therefore let not the farmer, by an ill choice, disappoint himself, and then complain of the uncertainty of his profession.

If he chuse more wheat, and have a piece of well enclosed land that lies warm and dry, and is light in its nature, and in good heart, let him not be afraid to sow it, because the season is advanced to February.

The properest ground of all is, where wood has been grubbed up; after a turnep crop also it will succeed very well for such land as we have named: after these growths the ground is easily put in order. Where a turnep crop has been just eaten upon the ground, the dung and urine of the creatures which have fed upon it, serves as a manure, and the cover of the plants has, in some measure, lightened the soil. A little tillage, after these advantages, and at this season of the year, will bring it into good condition, and the spring rains will sufficiently promote its growth.

If the soil be not quite so dry and light as we recommend, the more care must be taken in the management of it. In this case it is but to work with a double plow, and sow the grain upon threebout ridges.

In



In other cases, where the soil is proper, it will be best to sow it in broad lands. As soon as the seed is harrowed in, let the farmer look to his dunghills for the best old rotten manure, and spread a covering of this lightly over the whole field.

If there be the convenience of employing a fold upon it, the advantage would be very great. For these light lands want treading, and the sheep will be at the same time doing this service, and enriching the ground: the seed will be better defended against frosts and vermin; and its shoot will be heartened, not delayed by this practice. Birds would be, in a great measure, kept away by the sheep and their necessary attendance: and as the season advances when they will have peace and the like large seeds, wheat will be in less danger.

There is a great deal of benefit in forcing the first growth of wheat that is sown so late as this, for it is in danger of mildews and other accidents of that kind, more than such as has taken an earlier growth; but the giving it a quick and strong shoot at first, answers this purpose, and puts it upon a level with that which has been longer in the ground.

Next month will be the great time of getting barley into the ground; therefore let the land be well and carefully prepared for it in this.

Oats may be sown with great advantage now upon all kinds of land that are proper for that crop.

Beans and pease are now to be sown, and they will come up without hazard; and be ripe in good season. The bean should be put in the first or second week in February, according as the season is, sooner or later, mild enough. Beans are apt to suffer in dry summers, but those crops are most damaged which have the least growth; therefore let them be put in early: they will not suffer from the cold; and the wet will set them to speedy growing.

A very safe practice is the sowing beans and pease in the same field, for if one of these crops fails, the other will succeed; and having so much the more room, will make up by its produce for the want of the other. Cold rains in May destroy many crops of pease; but beans are not hurt by them, and they will answer in the place of both where the other fails.

The difference of soil however, must be attended to in this matter, for that season may be very proper with one kind of land, which is not with another.

Thus, in heavy land, pease cannot properly be sown with beans in the beginning of February: the wet is too long detained in these soils, and if frost comes on upon this, the crop of pease will be lost. On the contrary, the wet favours the young shoot of the bean, and there is no danger of that crop.

The bean will bear other mixtures in the crop beside pease; and, in particular, oats: it is a very good practice to sow these together: they will take their growth very kindly upon the same spot, and when they come to be used, they do very well together for horses.

The grass lands will require the farmer's eye at this season, for he must think of the succeeding hay. The common manure of pond mud and dung may very well be laid on this month, best toward the beginning: and where the grass is thin, some rotten mould from under a hay stack is a very good addition; because it contains seeds of the hay, beside being itself an excellent and rich manure.

In the beginning of this month let deep rooting weeds be taken up; and if any shrubs have been suffered to stand, let them be drawn out of the ground in the same manner. When rains have fallen, let stones and other rubbish that have come on with the manure or otherwise, be taken off; and if there be new mole-hills raised or ant-hills, let them be cut down and levelled, and let the workman carry hay seed and some mould from the bottom of a hay stack with him: let him scatter on some seed wherever he has made the ground bare by cutting up these incumbrances, and strew over it some of the hay stack mould; then treading it in with his feet, let him leave the rest to nature. This will soon be the richest part of the ground.

Where the feet of heavy cattle have made holes in the moist surface, breaking through the turf; let the ground be rolled, and such cattle be kept off in wet weather, during the remainder of the spring.

If a wheat stubble field have been plowed up after harvest to prepare it for a crop of barley, it must be now well wrought again to prepare it for the last management in the next month, when the seed is to be put into the ground.

In this and all the plowings at the present cold season, let the farmer regard the weather. A great deal of snow or heavy rains should make him postpone this work at any

time, three or four days, or more if requisite; for it is not only inconvenient at those times, but hurtful. The best of all is in a dry season, when there has been a good deal of frost; but the thaws have softened the ground since. In that case the plow cuts easily, and no clod falls from the share, but breaks and moulders to pieces as it falls: this makes the ground ready to receive the next influences of the sun, air, rains and snows; and one well timed plowing of this kind will do as much as two that shall be performed at random.

This month sow vetches of the several kinds: they will shoot quickly, and soon cover the ground. Once weeding when they first come up, will be required, and no more; after this they will take care of themselves; and sheltering the ground will, at the same time, prevent the growth of weeds, and mellow it all over. They root so lightly, that they exhaust very little of the strength of the mould; and they suffer nothing else to exhaust it. The crop they yield is profitable, and the land is fit for a better after them.

This month run the horseshoe between the rows of saint-foin, lucerne, and the other large growing artificial grasses. They are preparing for their spring shoot, and this practice will give them great vigour. If weeds be risen among the young crops of them in the rows, it will be very proper to have them now pulled up by hand. As the crop grows at regular distances; this will be very easy; and it will not require to be repeated.

Where there is an opportunity to give the ground a second plowing for oats, let it be done now. The farmer should not grudge the expence of this when he sows oats alone, for the return in the crop will abundantly pay the advance in charge. When clover is to be sowed with the oats, it is absolutely necessary to give this double plowing; and the first week in February is the best time for the second plowing; and for getting the seed into the ground.

If the farmer find it convenient to change a piece of pasture land into tillage, this is a good season for plowing it up for an oat crop. Let the four coultered plow be used: and after the work is well performed by it in the beginning of this month, the oats may be sowed very successfully at the end.

If there be a design of draining bogs or other wet land, this is a good time for beginning the work. It will be easy to see, after the wet of a winter, where the discharge is most necessary, and where it may be best made, and the ground will now cut easily.

This improvement of land is so great; and when undertaken upon rational principles, is so easy, and so certain; that it is wonderful more of it is not done. In grounds that are only boggy from their situation, no more is necessary but draining, to put them upon a level with other land; in absolute bogs, whose nature is not like that of common mould, the task is more tedious; but even these may be reduced to good, and the charge attending this is always worth while, because the original value is little or nothing.

In the pasture and meadow grounds, if the soil be exhausted, if it have been left unmanured, or from any other cause the farmer is afraid, he shall have but a poor crop of hay the succeeding summer. Let him now sprinkle foot upon the ground; the rains will wash it thoroughly in; and the quantity, colour, and firmness of the shoot, will soon shew him that he has not misemployed the expence of this dressing.

If any piece of pasture ground be over-run with moss, first examine whether a lodgment of wet be not the cause, and if it be, remove it; then strew on coal ashes, and they will, at the same time, burn up the moss and nourish the grass.

If wheat, on a piece of dry ground, want refreshment at this time of its growth, nothing gives it more speedily than lime.

There is also another advantage, which is, that it destroys insects. There is a small vermin, which, at this season, gnaws off the shoots of wheat just under the surface of the earth; and in some grounds it does great mischief. It is chiefly in dry soils this creature lives, and for the same reason it is most hurtful in dry seasons: wet kills it.

Lime, from a different cause, has the same effect; and I have seen a whole crop that was in danger from it, greatly recovered and absolutely secured from farther mischief by this practice. If rains follow the sprinkling on of the lime, scarce one of these insects in a million escapes death.

This is a season at which farmers often turn in sheep upon their wheat, and very properly sometimes; but they do not manage this matter with sufficient discretion. The



advantage to the sheep is very great, because the food is excellent. It fattens weathers, and supplies the ewes with milk beyond any other food: this also is a season when other foods are in a manner exhausted, and therefore this is doubly valuable.

These are the considerations which lead the farmer to the practice, and when this can be done without damage to the crop, they are very weighty and great ones. But that must be carefully called into the account. The properest wheat crops for this service, are those which have been sown in September or October. These have, in the very beginning of the present month, a tall and strong shoot; and the danger is their running up too fast, not their being late. This is prevented by eating them off, and it is attended with no danger or damage whatsoever. The sheep eat only the useless leaves, these would fade of themselves as the stalk shot a month or two afterwards, and it is better they should feed so valuable a part of the stock.

The best soils and land that is most in heart, give the fairest opportunities for this practice: for it is in such only the wheat is in danger from growing too fast: on the contrary, in land where the wheat grows slowly and weakly, this must by no means be allowed, for weeds will overpower it before it shoots for the stalk after this eating. On the contrary, there rise more and better stalks always after feeding in the proper lands.

Look over the hedges the beginning of this month, and those which require plashing should now have that dressing. From seven to ten years is the time of growth which makes them want it; sooner or later according to the soil and the shrubs.

If the farmer have a design of planting on any part of the ground, whether it be timber or fruit trees, this is a very good time for it. And to avoid the miscarriages of others, which are more common in planting than in any other article, let him carefully regard the cautions we have given in the former volumes. Let him suit the trees to the soil, and never attempt to force nature to bear what is against her original course.

Let the trees be brought from a soil of the same kind with that, in which they are to be planted, but somewhat poorer. Let there be large holes opened for their reception, the mould well broken, and carefully laid in among the roots; and the tree not planted too deep. Let it be secured by a good stake, and defended from gnawing of cattle. In the trimming it, let regard be had to the shape it is intended finally to have, and neither let too much top be left nor cut it too close. Moderation is the rule. He is very idle who supposes a transplanted tree can bear the same head it did before removal. But the common rash use of the knife is as wrong as this. If sufficient shoots be not left on to draw up the sap, the course of vegetation is impeded, and this is as wrong as to leave on a quantity of boughs which must die.

Where ditching or any other kind of digging is going on, let the careful husbandman overlook the work from time to time; and examine the earth which is thrown up: he may this way make discoveries that may enrich him. We have given the marks and characters of the various kinds of valuable earths, or substances found in the earth, and let him strictly attend to them. Marle is more common than is supposed, it is to be had in a thousand places, for any one wherein it is known; and the advantage of such a discovery is very evident.

He will see, by these examinations, what earths he has upon the ground that can be serviceable for the improvement of others, and it is possible he may make more important discoveries.

In cutting drains for boggy ground, let him observe whether the earth under the surface be of the peat kind: if it be truly such, he has the greatest advantage in draining the bog, for the peat pays the charge.

In the yard let the good housewife see to her early broods: they will require more of her care than those which come at a warmer season; but in this, as all other instances, where pains are rightly taken, the price of the thing much more than returns the charge and labour.

As the season advances in warmth, the innumerable army of devourers of the insect kind, will be rising upon the farmer; but due care will destroy a vast many of them at this time. The good use of the roller in the plowed lands will crush them as they hatch, and a few days labour secure the crop for the summer. The beetle kind are first worms, and many of these are very destructive in tillage land. This season brings them toward the surface of the ground, and they perish under the weight of the roller like the slugs. The best time of the day is in the morning

very early, for they are then upon the surface or close under it. Afterwards they go deeper, and the roller passes over the place without hurting them.

The advantage to the crop from this practice is much more than the destroying of these vermin, for it presses the earth to the roots which the frost had loosened.

These are the advantages of rolling corn lands, and this is the time of doing it, for the same reason that it is the proper time of eating off the growth; because it is a growth of leaves, not stalks; for in case the stalks were formed, and had any degree of firmness, the roller would break them, and they would very difficultly recover it.

## THE HUSBANDMAN'S KALENDAR.

### MONTH THE THIRD.

#### MARCH.

**I**F a crop of wheat be intended yet to be put into the ground, the farmer must employ all possible attention to its growth, or he cannot expect it to be ripe in time. Nor is this all the hazard: from the very hour of committing it to the ground to its gathering, it is exposed to more hazards than what is sown at any other season.

These are reasons why the farmer should never, by choice, defer a wheat crop so late as March; but there are occasions which may require it: for the accidents and circumstances which may influence a particular person, are endless.

In this case the hope of success will depend upon three things, the choice of seed, the manner of sowing it, and the enriching of the ground while the crop is growing.

The seed wheat must be chosen from such kinds as are short in the stalk, that the land may have as little as possible to supply beside the ear.

It must be sown, if the common way of husbandry be followed, in two-bout lands from the hand without harrowing afterwards, or under thorough, that is, to sow it by broad casts over all the land as soon as it is harrowed, and plow it in afterwards. These are the true methods on good loamy soils; but where the ground is very light and brittle, it may very well be done with a narrow plow, throwing it by broad cast and harrowing it in.

No corn is so much in danger to be devoured by birds, as wheat that is sown at this time of the year: and in the common way of management these are the best methods of securing it by the manner of sowing. The drill husbandry succeeds much better, and there are also other advantages very considerable which should recommend this practice; but of these we shall speak presently.

Supposing it committed in the common way to the ground by either of these methods, the farmer must give it a good top dressing of the richest ingredients, to promote its shooting fast and strong, that it may, in some degree, get upon a level during the summer with that which was sown in more favourable time.

In the drill method, where spaces are left for the horsehoe to come between, the seed lies secure, and there are opportunities of giving it continual supplies of nourishment. Every time the intervals are turned up by the hoe plow, a fresh fund of nourishment is given to the plants, and they shew it by a sudden growth. This way it is easy to bring a crop of a proper kind of wheat sown in March, to the same degree of forwardness by the end of summer, which those have which were sown in the common way naturally, and this is the only method in which it can be done with certainty. The hazards are too great in the other way, for the farmer's ever running the chance when he can avoid it.

Sow barley this month upon the ground we have directed to be prepared for it. If the soil be dry and not rich, the drill plow is always to be preferred on this occasion. Hoeing is easy in these lands; and where only the common hand hoeing is intended, these rows laid regularly in by the drill, will give opportunity to doing it with the greatest ease and advantage. But the true method is to drill the seed at such distances, as to give room for the hoe plow in the



the intervals, which destroys weeds, and feeds the crop beyond all manures, and at a much less expence.

The second week in March is a very good time for sowing barley in low and somewhat moist grounds.

Oats may also be very properly sown this month, and the later pease should be put into the ground before the middle of March. The maple and union pea are of this kind, and should never be put in sooner than this.

The vetch kind and lentils may be sown also this month with success.

The first week in March, or if the season be severe, the second, are to be preferred to any other time for the sowing of clover.

In wheat crops it may be very well sowed at this season, for the roller may yet be used successfully; and this will press down the clover seed sufficiently into the mould; and at the same time will lay it closer about the roots of the plants.

About the middle of March plow up the intervals of the fainfoine and lucerne grounds, which have been sown by the drill for that purpose. This will clear the ground from the first shoots of weeds, and at the same time be furnishing the crop with a fresh supply of nourishment.

Pasture ground will, this month, require a great deal of the husbandman's regard. When he shall cut it up for hay is an article of importance; but the reasons may be so different in various cases, that no exact day can be named.

Let the ground be cleared from all sorts of rubbish, and carefully and well rolled. This is a season at which the roller has the greatest advantages. The feet of cattle will have made some impression, and the ants, moles, and worms will be throwing up, and raising, according to their various natures, hills and lumps of soil, such as the farmer has, with so much care, before cleared away.

If the care, we have before directed, have been taken of the ground, the inequalities of this kind can be but new and small, and in that case the use of a heavy roller is an excellent preservation. The ground will now be mellow from the frosts and wet, from the snows and rains: it will therefore easily receive the impression of the roller, and these new raised heaps of earth will be crushed flat at once. The ants will be destroyed in a great measure also by the operation, and these are the worst of all this kind of vermin.

Let thistles, which now shew their large leaves, be drawn up with their roots. The condition of the ground also favours this; and the necessary treading upon the grass in doing it, will produce no damage. If there be bushes springing up in any part near the hedges from the running roots of the shrubs, let these also be treated as weeds of the worst kinds, and pulled up by the roots.

Brambles will take root at the ends of their branches, when these droop and touch the ground; and thus the hedge will be brought forward into the field to the great loss of ground to the careless farmer. These must be torn up as the rest: all this should be done just before the rolling, and thus the whole spot will be clear and free for the growth of the hay; the surface will be level, and the mowers will be able to cut an inch closer to the ground than they would do if it had been neglected.

If the farmer would know the importance of this, let him compute what proportion an inch bears to the full growth of his grass. He will find this is the addition of a very considerable quantity.

Turn and make up the dunghills, and other collections of manure and compost, add to them the cleanings of ditches, and the refuse of the yard and garden; and from time to time throw up the liquor which runs from them all over the surface. The rains make a great deal of this drain off at the present season, and it carries away, if suffered to run to waste, a great part of the virtue of the manure. On the contrary, when it is thus from time to time thrown upon the heap, it assists, improves, and renews the fermentation.

There are two kinds of manure of great value, which are now in their highest state of perfection. These are sea weed; and the spawn of shell fish. The spring winds drive them both in vast abundance to the shores, and up the mouths of rivers, and the farmer should not miss the opportunity of gathering them.

The spawn, and the more tender kind of sea weed, are excellent for present use when a crop requires the assistance of a top dressing. They dissolve easily with the rains, and the sun has not yet power to exhale their virtue.

The other kinds of tougher weeds should be made up into a heap with earth; or mixed in the common dunghills when they are turned at this time of the year; in ei-

ther of which methods they make an excellent manure for autumn.

Among the top dressings that may be used to a weak crop at this time, old woollen rags come under consideration, and they are of very great service. No manure is more apt to lose its virtue when laid on in a hot dry season; because a great deal of it is owing to the perspiration of the people who have worn them; and this being of a volatile nature, is easily raised with the heat: at this time of the year there is usually rain in abundance, and not much heat; therefore the saline parts dissolve and are carried into the ground, giving a fresh strength to the roots of the crop, just when they are about to make their most important shoot.

Hogs dung is another of the manures, which, for the same reason, succeeds excellent when sprinkled over a crop at this time of the year. No dung is so loose or light as this. The sun and winds in dry seasons presently reduce it in a manner to chaff; and the virtue is lost: but at this season, this light part, in which consists its value, is not evaporated, but washed into the ground.

The farmer who has bank fences, must now look to them with care. The frosts and the succeeding rains have mouldered and washed them away in some places; and often the blowing down of a stump, or the tearing up by boys, will have taken away a piece of the bank with it. This is the season in which the repair is most easy: the ground cuts freely with the spade, and yet has so much thorough moisture, that when struck with it upon the bank, it will get into a firm and tough substance, adhering together closely. Labour is less required now than at many other seasons, and this is a condition of the ground that should not be neglected, for this is the easiest time of performing it as well as the most natural and convenient.

## THE HUSBANDMAN'S KALENDAR.

### MONTH THE FOURTH.

#### A P R I L.

THE season now comes on when the crops of all kinds will be making their greatest advances in growth; and the farmer must be aware that weeds will grow with the same vigour among them. Indeed with more, for they are the natural produce of the soil; the others, in a great measure, artificial.

Weeding is now a most essential article, and that farmer is happiest, whose crops are so disposed, that it can be done most easily and advantageously. Here the drill and horsehoeing husbandry shew their value.

The regularity of disposition in those methods, admits the labourer's course in destroying these incumbrances of the ground without interruption; or damage to the proper growth.

In all drilled crops, which have small intervals, let the ground be cleared by the hand hoe; and in those where the horsehoe can come in, let the intervals be well broke and turned up by that instrument.

Many let the weeds get some growth before they destroy them, and, in the common course of husbandry, it must be so for many reasons; but all the time they are taking that growth they are exhausting the crop, and it is at a season when this is most hurtful of all: on the contrary, when weeds are destroyed by this early care, by the hand or horsehoe, the crop is cleared before these intruders can have got any great quantity of nourishment from the ground; and the same operation prepares the earth for giving the plants fresh, free, and abundant nourishment.

In crops of wheat raised in the common way of husbandry, where the ground is very full of weeds, it will be necessary this month to clear them away, but vast care must be taken that the corn is not trampled down at the same time.

This is all the direction that can have place with regard to a wheat crop; for it is too late now to sow it. But there are many other kinds which may properly be now put into the ground.

Barley may be sown this month with great advantage. In



In general the dry, warm and rich soils should now be sown with it, and the others the foregoing month.

Sow oats the second week in April; and according to the weather, blue pease the second or the third.

In tough soils, provided they lie dry, barley may be very profitably sown in April; but it must be first steeped in some of the mixtures already directed for this purpose; and the best method is by the drill and horsehoeing husbandry, because in that manner the ground may be broke by tillage while the crop is growing. Many are deterred from sowing barley at this season for this reason; but they have nothing to fear from the nature of the soil, if they will take the precaution of using this method of husbandry.

Some care should be also taken in the choice of the seed corn for these improper soils. That which has grown upon a crumbly loam, succeeds best upon these grounds.

The ground should be always well enriched for this crop, for barley will come to good when it stands very thick, provided the ground have been in good heart for it.

Sow white oats this month: and according to the purpose of the land afterwards, let this crop be put into the ground alone or with clover seed, or the seed of some of the other artificial grasses.

Sow the latter kind of pease as long as to the end of this month. Those which are put so late into the ground will often succeed better than such as have been ventured early: pease are a crop that are frequently injured by cold; and these, which are sown when the great danger from that is over, often overtake such as were nipped after their first shooting.

The drill plow is the best convenience that ever was invented for regular sowing, but care must be taken in the use of it on this occasion, otherwise the old method is better. As the drill is a regular machine, the seeds which are sown from it must be also regular. This is the case of most kinds, but pease and beans often differ in shape and size so much, as to obstruct the regular discharge of them. The seed must be looked over and sorted for this purpose, and it will then come as regularly from this plow as the wheat or other corn.

Vetches may yet be sown: but let the farmer chuse the right kinds; we have given him the distinction between the several varieties in the preceding part of this work; and he must attend to them if he would assure himself of success. In most crops we prefer the drill and horsehoeing method: but more is to be considered in these than the produce of the plants, they are to improve the ground as well as to afford the crop. The improvement they give is owing to their slight rooting, and the spreading of their stalks which cover and shelter the whole ground, and consequently prevent the growth of weeds, and give a lightness and mellowness to the soil. For this purpose they are best sown at random all over the ground, for if in drills with intervals, although the vetches will be better, a part of the ground will be uncovered and will want the advantage.

When vetches are raised for producing seed, or for the absolute use of the plants themselves, the sowing by drill is vastly preferable; but when there is the farther advantage expected of mellowing the ground, let them, by all means, be scattered in the old method.

The ground, intended for turneps, should now be plowed up well and thoroughly, to break its particles, reduce them to a proper degree of fineness, and give them the impregnation of the air, dews, sun and rain. The neglect of this needful tillage, at the present time, leaves the ground to be exhausted by the spring weeds: and consequently the plowing has a double advantage; as it at once destroys these, and prepares it for receiving all the benefit from the air.

The last week in this month is a very good time for sowing turneps for prime use in July. If rains follow, there will be no great fear of success: but let the farmer always sow old and new seed together, because it comes up at a few days distance, and one of the crops may succeed, though the other should be devoured by that terrible enemy the fly.

It is a practice with many, who sow their turnep seed in drills, to sow pease in the middle of the intervals. This they do by way of getting two crops from the same ground, but all that is saved is not got. One of the crops, which had the fair advantage of the soil, would be worth the two; and the ground is exhausted, which, in the other case, would have been recovering itself in the intervals while it was feeding the rows.

The kitchen gardeners about London taught them this, and even among them it does not answer so well as they imagine; the great rent of ground near London, and the expence of the vast quantity of manure they lay on, makes it necessary they should make the most of every inch of the

land, but though the richness they give it makes the double crops thrive tolerably, they always hurt one another; and if this be the case in the garden, there is no doubt but it will be much more so in the field, where the dressings cannot be supposed to be so perfect, either with respect to quantity of manure or tillage, or where the extream price of the ground cannot make it necessary.

Let the farmer remember what we have said, and what experience shews with regard to the produce of land from the drill and horsehoeing husbandry. The small number of plants upon the ground, is one cause of the vast success of this practice. This may teach him, that not the number of plants make the greatness of the crop, but their good nourishment. One plant, which has free air and full soil, will produce much more than a crowd of starved ones upon the same spot.

Plow up the land that is to be sown with wheat in the following autumn: break it well, and throw it up in ridges; that it may have the benefit of the spring rains, and the succeeding summer's air.

If it be neglected now, the rains will run off which should enrich it; and the weeds of the spring, which are various and innumerable, will exhaust it as much as a common crop.

Plow up the land that is designed for rape. The stiffer the soil is, the more plowings it will require; and the tillage must be repeated at times till the middle of July, when the seed may be sown; and the plants will get such root as to stand, without hazard, the winter's severity.

The roller may now be brought over those crops, which are not of such growth as to suffer by its breaking their stalks. When they come to this condition, it cannot be used without damage: now it will kill the common devourers, and greatly assist the crop. Pease will get great advantage from this method. The naked snail is now making its havock among them, and it will be destroyed by morning rollings, and its very flesh washed into the ground, will assist the growth of the crop it would have otherwise devoured.

Continue the roller upon those grass grounds which have not yet had the benefit of it; and when this is done, shut them up for hay.

If hedges, which require plashing, have been let alone till this time, the season alone can determine whether it may or may not be done now.

If the sap be so far risen, that the bark sits loose upon the wood, and will start away from it on bending down the boughs, it must, in that case, be let alone till the next season; but if, upon trial, the stuff is found to bear it, the work may be conveniently enough done now.

Plant quick, where it is wanted; look over the plantations of coppice wood, and prepare them for taking the summer growth to advantage. If the plants stand any where too thick, pull up a few and plant them where there are vacancies. In the damp parts of the ground, where the common growth is most apt to fail, thrust in fallow truncheons at proper distances, to make up the deficiency: they will now grow freely, and soon be upon a level with the rest. Where the defect is greater, lay down a shoot from some of the next plants, fastening it in, and covering it three inches with mould. Leave a foot of the top out, and there will soon be a growth to supply the gap.

This done, if any rise ill shaped, cut them down within four inches of the ground, and leave them to make new shoots. Pull up any large rooted weeds, and lastly, make good the fences. Thus leave all to nature.

## THE HUSBANDMAN'S KALENDAR.

### MONTH THE FIFTH.

#### M A Y.

THE land that is intended for sowing with wheat in September, if it have not yet been turned up in the fallow, will require to be well wrought now. Earlier in the season is better; and the last month is the very best of the year, because the air is then fully impregnated with those particles, which give fertility: but if it have been omitted then, the best time is the beginning of the present month.

After



After this it must be turned up as often as the weeds appear of any growth upon it: otherwise the farmer is enriching with one hand, and leaving the soil to be impoverished from the other.

The same tillage which destroys the weeds improves the soil; and according to the nature of the ground, and the intent of sowing in the common or drill method, more or less manure is to be used.

In corn that is now growing, the drill and horsehoeing husbandry alone can do any service. If wheat have been managed in that manner, this is a good season for plowing up the intervals; and the hoe plow may come a great deal nearer the rows of corn than it could be brought when it was younger, and the danger greater from frosts.

This plowing up the intervals never fails to promote the growth in a very great degree; and where the wheat is poorest, it is, for that reason, most necessary.

On the other hand, in crops, sown according to the common practice, nothing can be done to refresh and forward the growth, but a top dressing of some of the warm manures.

The beginning of the month is the proper time for it, and if the weather promise to be showery, it is so much the better. The farmer should wait a few days, though the season be advanced, for that advantage: the sun has power in May; and these manures, when scattered on where they cannot be plowed in, will soon waste their virtue unprofitably, if it shine upon them.

Barley may be sown this month, but the preceding is better. However, as there may be many occasions that lay the farmer under a necessity of doing it; let him take care to chuse a right kind of seed. If turneps have not been eaten off in time, it may be necessary now to sow barley, which otherwise it would have been better to put in earlier, or if the ground have not been got ready in better time, this season, with proper care, will do.

The land must be brought to a great fineness, and the proper barley is the Rath-ripe or Fulham kind. This must be steeped before sowing; and I have been told by those, who have experience, that the method of dissolving the salts in a decoction of barley instead of common water, has great advantages on this occasion.

The method is to boil a quantity of good barley in as much water as will be necessary to make the steeping liquor; and when it has been half an hour burst, the liquor is to be strained off.

The barley is not entirely wasted in this case, for it will feed any of the fowls in the yard; and in the liquor the salts are to be dissolved.

The drill plow is best for sowing it, but it must be well limed first, that it may run freely through. In this way the great assistance it receives from the steeping, and the good condition of the ground, together with the nature of this kind of barley, famous for its quick growth, will produce the crop in time, even from this late sowing.

If the nature of the land, and a favourable season join to allow the practice of folding upon the new sown barley ground, it will be of great advantage. Every thing should be done that can contribute to quicken the growth of this crop, and the dung and urine of sheep have this plain advantage; but if the soil be stiff, or the season very wet, it cannot be done: in these cases, the trampling of the sheep does more harm than their manure can do good; it hardens a tough soil, and it poaches any ground in very rainy weather. In the first of these cases, the young shoot of the corn cannot get out of the ground; and in the other, it lets the wet into holes, which destroys it. When the land is of a light and loose nature, and the weather is fair and dry, fold sheep upon the ground as soon as the barley is sown at this advanced season; they mend the soil by treading, for they make it the more firm; and their dung and urine falls on at the time when the first growth is to be made, which it greatly forwards and strengthens.

Worms are often dangerous to the barley, which is sown at this season: it will be perceived by the fading of many of the first shoots, for the worms eat them just under the surface. Lime is the best remedy: it should be scattered freely over the surface, where this danger is seen, and it will either destroy or drive the worms deeper down, and at the same time promote the growth of the crop.

Saintfoine may be sown with barley this month; but the ground must be well enriched for this purpose. A dressing of soot is preferable to any thing else; and the folding of sheep on the land, as soon as sown, is as useful for the grass as the grain.

If showers follow, the sheep must be taken off, but the saintfoin will thrive vastly the better for so much wetting.

Turneps may be sown this month for the service of the latter part of summer; whether it be by seeding with sheep, in order to prepare the ground for wheat, or for sale, in the beginning of autumn. In these cases, a May sown crop will answer very well: but the farmer must not let these stand for winter.

Buck wheat may also be sown about the middle of this month with advantage.

Sow dyers weed or weld this month, and it will come to perfection in good time.

The oat crops are frequently in danger at this time from charlock, a weed that resembles mustard. The common method is a very imperfect one of managing it; they cut off the tops with hooks, and leave the root, and the rest of the plant growing.

This does some service; but the best method is to get it up by hand. This is chargeable, but the crop will answer it. When there is such a vast quantity, the produce of the oat cannot be expected to be tolerable; and the price that is paid for pulling up the weed, will be many times over paid by the advantage in the harvest.

Clover may be very well sown yet, for few seeds come up so soon. If the weather be favourable, eight days will bring it out of the ground. Care must be taken to chuse fresh and good seed; and the best way of covering it is by a bush harrow.

In the fields where the other artificial grasses are established, let the farmer watch the time of the first mowing, if they be sown in the new husbandry, so as to admit the horsehoe; and this have been used in the beginning of the month in forward soils, and favourable seasons, they will shew the buds for flowering, which is the mark for cutting the first crop, toward the end.

The cutting these plants upon their first maturity, is a very great article in the farmer's concern; for it prevents them from exhausting themselves at the root, and it makes way for the growth of a new crop.

Where lucerne has been sowed in the beginning of March, it will be necessary now to weed the ground very carefully. These plants are easily overpowered by weeds at first; but after they are established in the ground, there is little danger. If the lucerne be raised in rows, with intervals for the horsehoe, the work is easy; if otherwise, the handhoe must be used. In either case, this last instrument is wanted to weed between plant and plant in the rows.

Of all weeds in the lucerne ground, beware of grass. Tear this up on its first appearance; for where it gets footing, the crop will never come to good.

## THE HUSBANDMAN'S KALENDAR.

### MONTH THE SIXTH.

#### JUNE.

THE land intended for wheat in autumn, must be continued in a perfect fallow, and no weeds suffered to grow on it, nor the surface to grow hard by rest. In either of these cases, a great part of the benefit of the fallow will be lost. Weeds will draw the nourishment out of it, which should be reserved for the corn; and the hardness of the surface will prevent its receiving the impregnation of rains and dews, as is the intent of the fallow.

The wheat fields sown in the usual way, must now take their chance; for no service can be done them, if they want it ever so much: the stalks are so far grown, that the field must be left at rest, for they would not recover the damage they should receive by the feet of weeders.

In the horsehoeing husbandry it is otherwise. An unfavourable season will often make wheat require help in its growth in June; and the fullness of the ear will in a great measure depend upon it. This may be given by the hoe-plow, which turning up the intervals, and breaking the soil at the same time, destroys weeds, and furnishes nourishment.

Where the land is of a particular nature, or has been in particular crops before, and is now in fallow for the autumn sowing of wheat, the farmer must manage it accordingly.



ingly. Where the ground has been plowed in broad land, from oat or peas stubble across, it will be necessary now to turn it up crossways.

In the growing crops of this valuable corn, let the farmer watch that no accident happen; it will be now in the tender ear, and consequently in danger of mildews, and many other accidents. What can be done to prevent or remedy these accidents, we have explained at large under the proper heads; but the advice is of little use, that comes after the mischief is past; therefore let the care be taken now, to see the first approaches of these accidents, and apply the remedy in time.

If the late sown barley look weak and yellow, let some foot and pigeons dung be yet thrown on; taking the advantage of approaching rains, it will change the aspect of the field immediately, and the growth will be refreshed in such a manner, as that the former danger will be forgot.

The fields of oats will be now in danger from the tall growth of weeds; and the care directed in the last month, must be repeated in this, to destroy, or at least to reduce that inordinate growth, by which they will otherwise choke the crop, while they are at the same time exhausting it.

Sheer sheep the second week in June; and take care they be first well washed and dried. The wool will be of considerably more value for being clean; and let the care of the sheep be the next consideration. A careless shearer will wound them; and the consequence of this is, flies blowing them, and worms breeding in their flesh, which torment them, and often reduce their value greatly.

In the beginning of this month, look carefully over all grass grounds. Examine the state of the crop in each field, and consider the time of mowing. This is a care too much neglected, and the farmer loses by that neglect a great part of his profit. The value of the hay depends, in a great measure, upon cutting it at proper age; and the absolute quantity for it is sold by weight. Hay which has outgrown itself, weighs much less than such as has been cut when in perfection. All plants are most full of vigour when they are grown to the state of flowering, but have not yet opened their bloom. The grasses are of various kinds in the same fields; and they will not all flower just together, but there will be a middle time to be chosen, when the generality are in their greatest perfection. The true time is, when the buds are all formed, and some few have opened and hung out those white feathery threads, which are the most conspicuous part of their flowers.

At this period the stalk of the grass is fresh and juicy to the bottom; and the lower leaves are plump and green. The juice is not only full in them at this period of growth, but it is rich, and in the highest degree of perfection.

If the grass be cut at an earlier time than this, the stalk, though full of juice, loses a great part of it in drying, because it is watery, and evaporates quickly; whereas the hay which is made from grass cut at proper ripeness, loses proportionably very little.

When, on the other hand, grass is suffered to stand a great while before it is cut, after it has attained the due ripeness, the stalk grows yellow, and fades at the bottom; the lower leaves decay, and those above become light and dry. Nothing is in good condition but the ear, which is not what is regarded in hay; and therefore it is always a loss to feed it at the expence of the rest.

The proper time being thus watched for cutting, let the farmer follow the mowers in their work, to make them cut close; and that they may be able to perform it well, let him examine their instruments. The scythe should be notched rather than turned upon the edge, and the edge itself should not run perfectly strait, but in a waved line. It is the property of good steel, when joined to iron, to run thus; and where the edge is quite strait, it is a proof the metal was bad.

The quantity of manure that has been laid upon the ground, promotes the early ripening of the grass; and also the growth of a second crop. In proportion as this is to be had in abundance, or not, the farmer should expect a second crop of hay, or prepare for feeding upon the growth, which comes after the mowing.

When a second crop is expected, the first should be cut somewhat the earlier; and the same caution in cutting close may be observed in this, as when the latter growth is for feeding only. For though it is the great article to get the second crop ready in time, yet the cutting low does not prevent, but rather promote it: for the second growth is all fresh shoots, and the less is left of the old stumps, the more readily the new shoot is made.

The hay, in this case, should also be got as quick as may be off the ground, that the advantage of free air and sun may be had for the crop.

In the northern counties, they mow by what they call loping in. This is by cutting with a swing from the right, after raising the scythe a foot and half. This is an irregular and uneven way of cutting. They tell the owner, that if they don't cut low enough at first, they come with a second stroke: but this does not answer his purpose; for what they cut thus at the second time is so short, that it is not taken up by the rake, and consequently it is not added to the quantity of hay. The farmer should not admit these excuses, nor this way of cutting.

The mowing with short strokes has also great disadvantage; the grass is irregularly cut, and a great deal of it is left too high, as may be seen in the sweeps and ridges, after such mowing: this and the other way are both easier to the mower than the true deep even cut; but the farmer suffers: he should see first that their scythes are good, and then that they make all their strokes in an even sweep, large and close to the ground. There is no doing this, unless the scythe itself be good: frequent whetting of a bad one, only makes it worse, and the bad edge of this instrument is always to the farmer's disadvantage.

The hanging of the scythe is a great article for the ease of the mower; if it be hung narrow, there must go more strokes to the same work; and when duly wide and flat hung, it does the business best of all, as well as most easily.

The making the hay we have directed at large; with regard to stacking it, there is one caution of importance which is too often neglected. The farmer forgets that rains come most with a south wind, and leaving the hay as much exposed to that quarter, as to the others, he finds it afterwards considerably damaged there, while it is sound in every other part. Let him take care to defend it, particularly where the danger is: let the stacks always have their end toward the south; and in making it up, let the middle always be kept highest, the wet will by this means be naturally thrown off.

When a crop of any of the artificial grasses has been cut, let the farmer throw on a little light and rich manure, by way of top-dressing, when they are sown in the common way; and if in the horsehoeing method, let the intervals be plowed immediately after the crop is off. The reason of both practices is the same, that a quick and vigorous shoot may be made for the new growth; and it is seen by repeated experience, that the plowing up the intervals in the new husbandry, answers this purpose, just as well as the manure in the old.

When ground is intended to be sown with any of these in autumn, let it be well plowed now, and the clods carefully broke; these seeds require a fine and fresh mould, and this summer fallowing gives both those qualities.

If weeds have got footing among saintfoin, when sown in the common way, let them be carefully pulled up at this season; and let the farmer, particularly in his lucerne field, beware of grass. He must destroy the first shoots of it, or he will lose his crop.

Where the corn or oats are over-run with tall weeds, thistles, sow thistles, and the like, let the mower at odd times go in, and cut off all the heads of them. A few strokes of the scythe do this without damaging the crop; and the consequence is very beneficial, for this is the season when they would be ripening their seeds, and the cutting away the heads prevents a vast deal of their natural produce for the next season.

The crop also has its advantage from this particular time of doing it. All weeds exhaust ground most, when they are of the largest growth; and most of all, when they are about forming of their flowers and seeds. This is a time at which nature is busiest in her operations; and the crop, as well as his waste produce, being now in that state, there is great advantage in cutting off the one, to give the full supply to the other.

The crops of turneps should now be watched from time to time; and wherever it is possible, if the weather be dry, they should be refreshed with a little water. If they escape the fly at their first shooting, and the effects of a violent drought afterwards, till they have some strength, they will then defend themselves from weeds, and be in no danger.



T H E  
HUSBANDMAN'S KALENDAR.  
MONTH THE SEVENTH.

J U L Y.

**C**ONTINUE the fallowing of the land intended for autumn sowing with wheat. The more it is broke by tillage, the better it will feed the crop. Clayey soils receive a particular advantage from being turned up at this time, and especially where sand or sandy loams have been used as the manure. The fault of these soils is their toughness and coldness, and these are very happily amended at this time, by turning them up with such ingredients mixed among them; for the sun calcines the clay, and the sand, at the same time that it divides, warms also the ground. This is all that is wanted to bring clay to be one of the best soils in the world, warmth, and a division of the parts. The farmer who lays on sand for this purpose, is sure to do right; but he expects the advantage in vain, unless he gives also the frequent and full tillage. Sand is a good instrument; and the chipings of warm stone, which we have recommended on this occasion, are yet better; but neither of these can operate, unless the farmer assists by breaking the soil, and mixing these among it by tillage; and exposing it at various times, and in different forms, to the sun, air, and rains.

In wheat fields, where the crop is growing, weeds are now very mischievous: all the nourishment they draw for themselves is lost to the crop, and the farmer will have lighter ears, in proportion to the number of these. They must therefore be destroyed if possible. In the new husbandry this is easy; and the hoe-plow, at the same time it does this service, gives a new source of nourishment to the crop. In the common husbandry it is difficult, but still something should be done; and according to the form of the land, and manner of plowing, more or less may in different places.

Let a labourer walk through the furrows with a pea-hook in his hand: let him pull up by the roots such tall weeds, as he can reach with his hand; and cut off the heads of the rest.

He is not to attempt to destroy the small plants; such as pimpernel and allheal, and snap dragon and corn crow-foot: these do much less mischief in their humble growth, than the charlock which lifts its head above the corn; and the sow thistles, and thistles of the common kind, which often are doubly of its stature, and are all full of a milky, or other thick juice.

These may be destroyed in less time than one would think; and the others will do little harm in proportion. Last year I saw a wheat field in Buckinghamshire, which partly from the nature of the ground, and partly from ill management, was so covered with weeds of this kind in the beginning of July, that the owner, who was not a farmer, but a gentleman who kept a little land in his hands, gave it up as a crop from which he had little or no expectations. At my advice he sent in a couple of weeders, who walking up and down the furrows, took every land between them, and two days finished the work, though it was no small field. The consequence was surprising; for it happened that every thing favoured. The corn which had before been as it were buried under this incumbrance of weeds, shewed itself better than was imagined, when cleared of them, and some rain following, the ears filled, and the crop was not inconsiderable. I doubt not but he put into his pocket two thousand per cent. advantage upon the price of this weeding. This is the farmer's proper way of judging. If he grudges a good weeding, because it will cost him a few shillings, let him be told his crop will be as many pounds better, as he lays out shillings on this occasion, and he will be induced to try once: he will be taught by the effect to manage in the same manner always. This is a necessary lesson; for wheat fields suffer greatly for want of this assistance. One such example ought to animate many to the improvement.

Look over the barley, and see how it rises; where it is in good order, and in what part it needs assistance. If the ground have been prepared with the care we have directed, there will be no need of help to it now: and if there have been neglect in any of these articles, the relief is difficult in

the common way of husbandry. The two accidents that may hurt crops at this season, are weeds, and want of nourishment. In the common course of the farmer's business, the weeds can be but very awkwardly and difficultly destroyed, as we have seen in a late instance; and at this period of the growth, it is scarce possible to give any assistance in regard to nourishment. This should strongly recommend the horschoing husbandry, for in that it is only sending in the hoe-plow, and both these purposes are answered at once. The weeds are all torn up, and the soil by tillage is enriched, as if it had been dressed with the most excellent manure.

Where the ground is very much encumbered with weeds, it will be best in this kind of tillage; first to send in weeders to pull up by hand the worst of those, which grow among the corn in the rows; they may throw these as they pull them up into the intervals, and the hoe-plow coming in afterwards, will bury them with the rest. The weeders for this purpose should be always sent in before the plow, because their trampling would otherwise hurt the lightness of the ground from the tillage.

Wheat toward the end of this month, is exposed to danger of two kinds from insects and from birds. The latter are the most readily seen, and therefore the damage from them is easiest prevented; the farmer often knows nothing of the others, but by the damage he sees follow them. It is then too late for remedy; we shall give him timely advice.

The corn is now growing to its size in the ear, and is yet soft and tender: insects find their way easily into it, and lodge their eggs there; the produce of which feed upon the very substance of the grain, and spoil the part which they do not devour. No care can be too great in guarding against this; and consequently no watch too strict to find the first appearance of the danger.

The fly which takes the wheat just after the time of its setting for grain, is small and black; it is about the bigness of the head of a large pin. They fasten upon the ear in vast number, and presently eat their way into the body of the corn, where they lay their eggs. From these are hatched small maggots, which devour a part of the flour, and spoil the rest.

When these flies come they generally are numerous, and a crop is often reduced greatly in its value by them; and sometimes, in a manner, spoiled entirely.

The farmer must look to his corn when the fly is likely to attack it; for it is in vain to attempt a remedy afterwards. He may dislodge the flies while they crawl upon the ear, and they are so tender, that a very little force destroys them: the eggs he can never get out or dislodge.

How he may best attack the flies, nature shews him. They appear most in dry years; for when there fall rains in any great quantity, they are washed off and destroyed.

In the dry seasons there are dews, and the farmer may take the advantage of them for this useful purpose.

Let him send in a couple of labourers with a cord, that will reach from furrow to furrow, and treat the crop, while wet with dew, as we have directed, against some other accidents. Let the cord be stretched across the land, and one of the labourers walking in each furrow; let them draw the cord gently and carefully over the corn, while it is yet wet with the dew. The flies will by this means be brushed off and destroyed. But it is essential that this be done soon after their first appearance, for otherwise their destruction answers no purpose. It is not the flies which do this mischief, and if they have laid their eggs in the grain, the killing them answers no purpose. It is for this reason we have advised the early and careful watching of the corn; for it is easy to prevent the mischief which it would be impossible to cure.

The other danger from birds comes on in its full force at the end of the present month; and they are so eager, that they will, if not prevented, often devour a great part of the produce. Pigeons are very mischievous at this time, and many of the wild birds. They first settle openly upon the crop; the others creep about the edges of the field, where there is shelter of hedges; and as the corn now is just between hard and soft, it tempts them greatly, and is easily devoured.

Many methods have been proposed for driving them off, but nothing answers well except the gun; nor is any scare-crow so effectual, as the birds of the same kind that have been shot, hung up by the tip of the wing to a pleasant bough.

These creatures are cunning; and when there has been mischief done among them, they are easily righted. This way and no other the corn can be preserved. As the farmer knows that it is about the hedges they most prey upon him; let him bestow his chief care there.

The



The fly which attacks turneps in the early period of their growth, is never more dangerous than at this season, because the weather is naturally hot and dry. There is a prevention at the time of sowing, which is to mix flour of brimstone with the seed some days before it is put into the ground. The damage from the fly is in itself so uncertain, that it is hard to say when any prevention has or has not been successful; but the generality of farmers believe this is of great use: the best quantity is an ounce of the flour of brimstone to every pound of the seed.

When the fly is upon the plants, the most probable resource is burning of orpiment. It is wonderful how vast a quantity of smoak, and how offensive a small piece of orpiment will raise. A charcoal fire should be made in some part of the field, from whence the wind carries the smoak all over it; and a few pieces of orpiment are to be thrown in at times. They will fill the air with a white thick foggy smoak, and this will often suffocate the flies. It does no hurt to the turneps.

In fields where the turneps have been sown early, and have escaped this danger in their first growth, they must be hoed when they have a little strength. This is necessary, partly to clear the ground of weeds, and partly to thin the crop. The plants should be cleared to about seven inches distance, and according to their intended use they may be thinned farther in the succeeding hoeing.

Turneps, though a very profitable crop, and a very safe one if proper care be taken, may easily disappoint the farmer, who has not given them the due advantages. These are good tillage; and a proper heart in the ground, due distance, and a clear space, not encumbered by weeds between.

The horsehoeing husbandry produces the largest turneps, but they succeed very well the common way.

The first week in July is very proper for the sowing of coleseed; and the farmer who has land of a right kind, will find this an extremely profitable crop. It will thrive very well on such ground as is too moist for the generality of his crops, and will make him a very good return. But in order to obtain these advantages, he must allow it a due care and attention. The coleseed plant is more of the nature of a garden than a field herb, and must be managed well, especially while young. The sowing at this time is a material article, because its success will in a great measure depend upon its getting good root before the winter. And after this it must be kept clear from weeds like a garden crop, and the growth properly thinned. The slug pursues it in the same manner as it does the common kitchen garden herbs; and after the plant has escaped, or got over this danger while young, the caterpillar is as mischievous a devourer for a great part of its growth.

The moister the land is, the more danger there is of the slug, for it cannot live in sandy, or other warm and dry grounds: therefore the more wet there is in the soil, the more watchful the farmer must be about this creature.

As the coleseed plant requires so much care and attention, it is best to sow it in drills, with intervals of such breadth, that there will be an easy passage for weeders, and for any kind of care of the crop. If it be sown at such distance, that the horsehoe can be brought in between, the plants will be so much the stronger, that they will very well answer the farmer's purpose, whether for feeding or for seed. Though this crop requires so much attention at first, it is, when well rooted, extremely hardy. Few plants stand the severest of our winters better.

The spring vetches sown in March and April, will be in bloom in the beginning or latter end of July, according to the difference of the time of sowing. As soon as they begin to open in flowers, they are in the highest of their perfection for cattle; and it is a very good practice at this season to cut them, and feed horses with them. They have many excellent qualities, and they are attended with no danger: they fatten cattle, and they encrease the quantity of dung. It is also found by experience, that the dung of horses fed in this manner, has not the rankness of what is made from dry food.

During their growth they will have mellowed the earth, by thoroughly covering and sheltering it, and their roots exhausting little nourishment from it; the advantage is very considerable. Those who do not use them as food for cattle, may now plow them into the ground, and they will rot in it, and prove an excellent manure. The method is to draw a heavy roller over the field, just as they are in the condition here mentioned of beginning to flower; and then to plow them in.

This must be done at the end of this month; and after the plants have lain to rot in the ground, there will be nothing more required than to harrow in the corn; three weeks or a month, according to the soil and season, are suffi-

ent for the perfect rotting of the stalks of this tender plant, and with the mellowness the soil had obtained before, from the perfect covering of the stalk, it will be in excellent condition.

This is indeed the perfect manner of using these small pulse. They grow upon the ground, and mellow it all the time; and the nourishment they had exhausted from it, in the mean while, is thus all restored to it again. The plants themselves being then buried under the surface, after having been pressed flat by the roller, rot in the ground; and they not only serve to assist in enriching it as a manure, but the fermentation which they bring on, happens just at that time when it is wanted for the seed. The earth is light and tender about the seed, and a passage is given to the young fibres of the roots, so that every thing promotes the vegetation.

Nor are these the only uses of this small pulse. Horses may be tethered in the field to eat off a certain quantity at a time, without over-running or trampling down the rest; and this practice enriches the ground like the folding of sheep upon it; for the dung falling warm from the horse, and his urine serve as a moist, rich, and excellent manure; and prepare the land for wheat, preferably to most other dressings.

The vetch is also an excellent dry food for horses; but to this purpose it should be mowed somewhat later in the growth, and a strict watching of the time and period of growth is in nothing more necessary, than in this article. The young pods, while the seed is small and tender in them, dry very favourably in the making of the hay, and nothing is a more agreeable or more nourishing food for horses. If the vetches be suffered to stand till they are large in the pod, the leaves will decay; and these are a very essential article in the value of this crop: therefore the proper method is, to cut them for this purpose, just when the pod is well formed, and while the leaves are fresh, and in good condition. It will then dry well together, and a most excellent and nourishing hay is formed of the whole plant.

Plow in the crops of buck wheat toward the end of this month, which were sown in May for that purpose. It is a quick growing plant, and will be in perfect order by this time. The exact season when it should be plowed in, is when the flowery heads are all formed, and are beginning to shew the bloom. It is a great improvement upon poor, gravelly, and hard loams. The growth of it upon the place has hitherto well sheltered and mellowed the ground: and till it comes to form the seed, this plant exhausts very little nourishment. When nature is employed in perfecting the seed, no plant exhausts land more; but it does this at no other time; therefore let the farmer be sure to eat it off, or plow it in before that period. Horses are fond of it, and it is wholesome food for them: it has also the peculiar value of coming at a time when other food is scarce. But the great benefit is that we have just named, of preparing a poor land to bear a good crop of wheat. To this purpose, when the heads are fully formed, and a few flowers appear, let the farmer go into the field at sun-rise with a heavy roller, and while the plants are fresh and full of juice, let them be all rolled flat to the ground; this will at the same time bruise and press them, and dispose them to rot: then they are to be plowed into the ground, the sooner after rolling the better, and there will be brought on the same light and useful fermentation, that we have described as the effect of the thatches; and the ground will be greatly improved.

The farmer is not to suppose this the only use of buck-wheat. He will find it very advantageous to let some stand for seed. The grain is large, and contains a great quantity of an excellent white flour. In such scarcity of corn as the present, it may very well be brought into use for bread; and at other times it will be serviceable to the farmer in feeding his fowls. The value and excellence of the Norfolk turkeys is very well known, and they are fed in a great measure with this corn, which is found to give a particular whiteness to the flesh of all fowls which eat it; and at the same time it feeds them so healthfully, that they are very juicy.

There is one poulterer not very far from London, who is famous for the excellent colour and taste of his chickens, and other fowls; many have wished to know the secret by which he exceeds others in his business: and I believe that his knowledge of the true use and value of buck-wheat, is either the whole, or at least a very essential article. The shape of buck-wheat seed, and the colour of its rind are too particular to be mistaken; and I have had the curiosity to examine the entrails of this person's fowls, and have found buck-wheat in them.



As the knowledge of this particular art of feeding fowls may be of use to the farmer, in the neighbourhood of great towns; or wherever there may be a demand for them, I shall inform the good housewife farther, that I think the other ingredient is rice.

Damaged rice may be bought very cheap at the first hand; and whoever will try a mixture of two thirds buck-wheat, and one third rice coarsely ground together, will find the flesh of fowls which are fed with it, will be of a delicate flavour and colour.

The plant itself is a good food for milch cows. They will eat it with great satisfaction; and it encreases the quantity of milk, and enriches it at the same time. The same good quality makes it excellent also for ewes which suckle lambs.

Let the farmer recollect all these uses of buck-wheat, and at the same time that it will grow on very poor land, and he will find that it might be much sooner than it is, with very great advantage.

Clear the alleys of the hop ground very thoroughly this month, and raise the hills a little with the parings of the alleys. No weed must now be suffered to exhaust the ground; the root of the hop spreads a great way, and the plant now requires all the nourishment that can be given it.

It is a custom with some to plant other crops in the alleys of hop grounds; but this needful caution of perfectly clearing the whole ground, shews the folly of that practice. The distance of the hop plantation will doubtless allow very well of the growth of other things between; but all they produce will not be at all equal to the difference between the fruit of a hop ground, where the plants have all the nourishment, and one where these crops are raised beside. This is one of the many proofs we have given the farmer, that all that is got, is not gained; for in these intermediate plantations in general, the loss in the principal crop is more than the gain by the other.

When the farmer has the advantage of salt water near him, let him take this opportunity of cleaning his sheep. They will now be recovered a little from the absolute nakedness of the shearing, and will bear this washing without pain or damage. It will clear away all foulnesses of the skin, and will destroy those abominable and troublesome vermin the ticks, which often torment the sheep at this season in such a manner, as to make them refuse their food, and pine away into the worst of illnesses. The expence of such a washing as this will be very well answered by the health of the flock; and by the clear and good growth of the wool.

Pull up that mischievous plant water crowfoot, or small spearwort. It is now in flower. The horned cattle will sometimes be tempted by its fresh green look to eat of it; and it throws them into many of those diseases which are troublesome, and often fatal to them in the month of August.

Fold sheep at this time very carefully upon the land intended for wheat; and that the soil may have all possible advantage from this excellent practice, feed the creatures well by day, that their dung and urine, and the perspiration of their bodies may all be warm and rich, and fit for this excellent purpose. This is the season at which the greatest benefit of all is done by folding: therefore if it have been omitted earlier in the year, the deficiency may easily be repaired, by doing it now.

For the same reason that this is the time when the land gets most good from sheep, it is now that the greatest benefit may be obtained from their dung and urine, in the covered fold for manure. We have given the method at large; and let the farmer who does not want the benefit of this folding upon his land, practise it now with all care, in the making up a quantity of rich manure from the cheapest and poorest of all materials. Any common dry mould will answer the purpose; let it be spread ten inches thick over the ground, at the bottom of the covered fold; and the dung, urine, and sweat of the sheep, will in a short time enrich it into one of the best manures in the whole compass of the farmers store.

Cream is very apt to grow sour at this season; and the good housewife must use all her care to prevent it. After it has stood two days, let her give it one boil up over the fire, and then pour it into a clean pan. After this she may for four days put in the fresh cream produced from her day's milk: every time she must put the whole into a fresh and perfectly clean pan.

A dairy should be at all times kept clean, but most of all now; and the housewife will find that half the faults which have been attributed to other causes, are really occasioned by a deficiency in this one article of cleanliness.

Eggs will be in this season in danger of spoiling upon the housewife's hands: but with care a great deal of this mischief may be prevented. The decaying of eggs is owing to two causes, the stagnation of the humours, and the evaporation of the moisture. The first is owing to their lying always in one position, especially if they be hot withal; and the other to the warmth of the air alone. To preserve them for a small time and from the first accident, they should be laid cool and single, where the fresh air has free passage; and once in ten days they should be turned: this preserves them a considerable time.

When they are to be kept longer, the method is to cover the shells with a coal, which will stop their pores, and so prevent the perspiration. Some do this by a varnish; but the easiest method to the country housewife is with fat. Reaumur of Paris found this to be an effectual method. The fat must be just melted, and the eggs rubbed over with it; nothing more.

The fields of wood sown in March and April, will now require to be kept clear from weeds; and if the seed have been sown in the common way, and the plants stand too thick, the hoers, at the same time that they clear the ground of weeds, must thin the plants.

We have recommended the raising this plant by the drill and horschoeing husbandry; and in that course the hoeplow must be now sent into the intervals. This will tear up all weeds, and give a fresh broken soil to the roots of the plants. Before the plowing up these intervals, it will be proper for a weeder to be sent in to pull up any weeds that may have grown in the rows among the plants; and the succeeding plowing destroying all others, the crop will be freed from all incumbrance, and furnished with a new supply of nourishment by the tillage of the ground, just at the time when it wants that assistance.

Wood is apt to suffer at this time of the year by the want of moisture in the ground, for its large leaves require to be well supplied; and if at any time they are flinted in this particular, not only their growth is affected by it, but their colour.

It is found by experience in all kinds of crops, that the breaking of the ground by plowing or digging about them, makes them bear the drought better than they would otherwise: and this cannot be seen in any instance more plainly than in this of wood. The truth is, that breaking a soil well, and throwing it up with a fresh loose surface, makes it more apt and ready to receive and detain the dews, than such as is baked by the sun, and hardened by rest; from the close surface of which they run off.

This is a good season for drying and burning of peat to ashes, which make an excellent manure. The hottest weather soonest brings the peat into a condition for this service; and the farmer must take a calm day for the burning them. He must take care that the peat does not burn so, as to exhaust itself too much. The chymists know that the virtue of ashes lie in their salt and oil; and the great power they have of giving fertility to land, is owing to these principles. Let the farmer be so far a chemist, as is necessary for his performing his business in a beneficial manner; and so much information may easily be given to him in this respect. The chymists know that the oil is what gives colour to the ashes of plants; and that a great degree of fire will burn it away. The farmer should know this: and accordingly he is not to burn his peat into white ashes, for in that case they will be robbed of the greatest part of their virtue. Let him watch the burning of the heap; and when the peat is come to a brownish red substance, let him put out the fire.

Nothing does this so readily or effectually as earth. Water would wash away the salt, and damage the ashes extremely, but earth, on the contrary, puts out the fire without damaging the matter; and becomes itself also a kind of manure by the calcination it receives.

Therefore, when the farmer has piled up his heaps of peat, let him lay by the side of each a good quantity of mould; a tough clayey soil is best: when the peat is burnt to the degree we have mentioned, let a labourer just break the heap, and then throw on this mould. It will put out the fire effectually.

After this, when all is cold, let him remove the heap just off the spot where it was burnt, and then dig up one spade depth of the mould from the very spot where it lay. This is an earth so calcined also, as to be reduced to the condition of manure; and this is to be mixed with the rest.

The ashes are thus encreased to a much larger quantity, and the whole is no way inferior to what they would have been alone.

Clover is a good and useful food for hogs at this season of



of the year; but they must not live upon it entirely. They should be turned in a little before noon, and driven out toward evening: and must have some of the common food at night.

Flax will be fit to pull, in many grounds, this month; and the exact degree of ripeness, for this purpose, should be watched with great care.

The hemp should have the soil broke between the plants, and if there be any weeds they should be carefully destroyed. The hemp is so strong a plant, that it is not likely it should suffer many to live among it; but what there are should be pulled up: they will be large ones, and consequently they will draw a great deal of nourishment from the ground, at the same time that the hemp wants it all.

The condition of this crop is, at this season, very critical; the value of the threads will, in a great measure, depend upon the supply the stalk has at this present period.

## T H E

## H U S B A N D M A N ' S K A L E N D A R .

### M O N T H T H E E I G H T H .

## A U G U S T .

**T**HIS month affords the farmer fewer opportunities of actual service, than almost any in the year, for his crops in general are taking their last growth, and his pasturage is recovering from the hay season. Neither of these admit of any assistance from him in the common course of husbandry: but in the horseshoeing method there will be great benefit in good plowing of the intervals between the rows in all kind of crops.

This will fill the ear and plump out the corn at the time when it is terminating its growth, and will, at the same time, be preparing those intervals for the reception of the seed for a following crop. It is the advantage of this species of husbandry, that while the crop is growing upon one part of the ground, the other is receiving the benefit of a most perfect fallow.

In the common course and practice of husbandry it must take its chance. Only this we shall direct the farmer, that where his wheat fields are over-run with poppies, it will be worth his while to have them pulled up, in such manner as can be done with any degree of convenience; not only for the benefit of the corn, but because the weed itself is useful: hogs are fond of it; and it agrees so well with this creature while suckling its pigs, that the milk is made abundant by it and very nourishing.

Though this month gives the farmer less employment than the generality of other seasons, the next will be full of business, and he must take advantage of the leisure of this to prepare for it.

A proper number of hands is very essential to a good harvest, let him now be taking measures for them.

Let him lay in provisions in time for the busy season, and brew the beer for his work people.

Let him mend up and repair the carts, waggons, and all other implements, that will be wanted at that busy time; and see to his horses that are to perform the labour. He should be now more than ordinarily careful to get them into a good state of health.

Let him now also provide for the mowing up his wheat in the barns; and make such mowsteads as will keep it out of the reach of moisture from the ground, and, in some degree, defend it from vermin.

The best foundation is a good bed of furze faggots: over which spread a layer of dry straw. The prickliness of the furze will keep off many of the creatures which are apt to be most mischievous in the barn. When the wheat comes to be mowed upon this, if there be any suspicion of dampness, it will be necessary to keep a hollow in the middle of the stack, preserving it all the way up to the very top. By this means the vapours will get out, which would otherwise do great damage to the corn; and vermin are often found dead in the bottom of these wells, the heat and vapour having suffocated them.

When this preparation is made for mowing the corn in the barns, the same sort of care should be taken for that which is to be stacked out of doors. The manner of doing this we shall describe hereafter, this foundation is all we

are concerned with in the present place; that being the work of the month of August.

A long square is the shape of the stack, and let care be taken that the bottom of it lie secure, and above the reach of damp. The true method is this, mark out by a gardener's line, the form of the bottom of the stack: dig away half a spade's depth of the soil in a sloping form all round it, making a brick drain for the perfect discharge of any water that may come there. This will throw off the wet from the heads of the stack. Cover the spot marked out with some small faggots of black thorn, laying them close and beating them down. Upon these lay a coat of furze faggots, level and smooth, and cover it with straw a little before the corn is to be brought upon it.

If the farmer intend cocking of his corn, the same provision should be made also in time, by laying a bed of black thorn, then a bed of furze, and lastly, one of straw. Or it may be proper to have a frame of timber in some places.

Whichever of these beds be preferred, the disposition of the corn is to be the same; the lower part of the sheaves is to be outwards, and the cock is to be raised smaller to the top. That kind of frame which is called the Dutch barn, is excellent for the preservation of corn; for the top is always dry, and yet the sides have free air. This plain contrivance is nothing more than four upright posts, with a moveable roof, which may be supported at different heights upon the posts by means of pins.

Toward the middle of the month, all this preparation should be ready, for the early white or Holland wheat will be then fit for laying up, and in succession the other kinds will follow. The lammas comes next after this; and last of all the bearded wheat.

Let the farmer take care he has the preparations we have named ready in time; and then let him look to his fields of early wheat, and examine carefully from day to day when the ear will be fit for harvest.

When the corn is full plump and ripe, let him determine in what manner it should be cut, by the sickle, the hook, or the scythe. The best crops should always be reaped with the sickle, which has a hacked edge: when the crop is somewhat poorer, the hook, whose edge is smooth, answers best: and where the crop stands thin, and the sheaves short, the scythe does fittest for the business.

No reaping is performed so easily, or so advantageous to the farmer, as that of the fields which have been drilled in rows. In these the reapers have room to stand conveniently, the corn grows in a proper manner for cutting; and they can without difficulty cut deep and smooth.

When the corn is soft in the ear, the wheat must lie the longer on the ground; that it may harden.

Weeds are always troublesome among wheat; but when the corn has been well ripened, and hardened in the ear, the trouble they give is all the damage: on the other hand, when the grain has been cut early, a great deal of care must be taken that weeds are not bound with it; for they will grow damp after the corn is dry; and will taint the corn, and do a vast deal of mischief.

Wheat, in the due management, may get a great deal of benefit on the ground after it is cut. A few slight showers will plump the grain, and do it nothing but good. The farmers always find that the more perfectly the wheat has been cured upon the ground, the better it will thrash; and this is no small convenience.

Though a little rain does this service to corn, too much wet will prove in the worst degree destructive. It will rot the grain in the ear; and the farmer who knows the danger of housing it damp, will find it very difficult to find how to avoid that necessity.

In this case the method must be by actual heat. A malt kiln is the best convenience; and the sheaves should be laid upon hair cloth, or some other open substance with a very moderate warmth; and turned till they be perfectly dry.

Rye will be ripe for cutting about the middle of this month. The time will be a little sooner, or later, according to the management and use that has been made of the spring shoot.

No crop will bear feeding in the blade so well as rye; and the manure left upon it by the cattle taking so good effect, that in favourable seasons, when the farmer has found occasion, he has had it eat twice in the spring season; and yet found it come to a very good account afterwards.

After the ripe corn is cut, it should not be left too long in the field, for being very vigorous, the rains will make it grow in the ear, and the farmer will lose all his expectations.



In general it should lie three days upon the ground before binding, but two or less will do. All this is to be governed by the season. If a shower fall the first or second day, it will do nothing but good: but if after this let the farmer be upon his guard, for there may be mischief.

A good crop of rye may be got off a pea stubble; and this is not cross cropping of the ground: it feeds sheep in spring; and the ground is dressed rather than exhausted by it.

Let the field of barley also be examined toward the latter end of this month. When the ears of barley hang down, and the grain is hard within them; and the stalks are perfectly yellow, not green in any part, this crop is fit for cutting.

It should always lie three, four, or five days upon the ground after cutting, because the dews swell the grain, and improve the flour that is in it; and the farmer may venture this with less hazard than any other crop, because the grain of barley, from the nature of the husk, is held fast, and is not apt to shed.

The Fulham barley, which is ripe in ten weeks from sowing when the soil and season are favourable, comes in sometimes early in this month for cutting. The great art in mowing of barley is to take it when it is not quite ripe, when the ears droop; but before they hang. And when the grain is hard, but not dry; in this case the air swells the grain a little, and this improves it in colour and quantity of flour. The judicious farmer will take particular care of this article, because he will have a proportionable price.

When barley stands very upright, it should be cut with the scythe and cradle, and in this case it falls in the most even and regular rows. The raking, cocking, and all the rest of the work proceeds best and most easily after this; and there is little or no waste.

Where the crop does not stand quite so well, the scythe and bale should be used; and only for the worst of all the plain scythe. The reason is very obvious; for the waste which follows this confused manner of cutting, is and must be very great.

There is a chance the farmer may take of a crop of barley, much earlier than any of these, which is by sowing it in autumn. But the success depends in a great measure upon the succeeding weather. If the winter be mild, the success is certain. Chance led to this, as it does to many other discoveries. They who first sowed barley in autumn, meant it not for the grain, but for a spring seed upon the blade. They found that by means of the dung and urine the roots shot up strong for stems soon after, and they reaped a crop they little expected. It is fit the farmer should know this, for there are circumstances in which it may be a very good and profitable practice.

In the same manner barley and wheat may be sown together in autumn, in order to make a good kind of bread for common families. Chance first seems to have discovered this, as well as the other: a person plowed up a barley stubble once and no more, and then harrowed in wheat. The barley which had been shed and scattered upon the ground, was plowed in and harrowed over with the wheat, and shot with it. The winter proving mild, it continued to accompany the wheat in its growth, and both became ripe together.

This may be done also on certain occasions by the farmer, to his great profit. He will learn by this, that the properties of the several kinds of grain are not so absolute as might be imagined. We have shewn him before, that wheat may be sown in spring, and ripened the same summer; and he sees by these instances, that barley may be sown in autumn, and out-last the winter. He is left to his own management, therefore with more freedom than is usually thought, and according to the circumstances, may very well expect crops in a various manner.

Oats will come also to be cut this month, especially if the season have been favourable, and the land has had good tillage.

The black oat exhausts the ground less than any other, and this may be a very good reason for sowing it on many occasions; but the white oat makes the better oatmeal.

Five quarters of oats from an acre is accounted a good crop; but the same quantity of land is able to yield doubly so much. The custom is to raise them without manure; but if they have this assistance, they will very well repay it; and taking on the whole account, it will be well worth the farmers while.

It is observed, that after severe spring frosts oats succeed greatly. The reason is, that frost mellows the ground. It has the same effect with tillage; and the farmer may always supply its place by tillage.

They err extremely who do not allow sufficient plowing to the ground for this crop, for the produce will answer greatly for a little more labour: and the ground suffer nothing.

The cutting of oats should be the same as that of barley. If they stand upright and well, it is best done with the scythe and cradle, which makes even work, and lays them in a very regular manner on the ground, and this prepares for the regular and easy management of all the rest of the work. If the crop has been laid; or the plants thrown different ways by winds, they cut them with the scythe and bale in most places; and when the mower understands what he is about, this does not make bad work.

It has been found lately, that oats will stand very well through the winter; and after supplying sheep with food at times, when that is a very essential article, they will yield good crops at harvest time.

They may be sown for this purpose in August, September, and October; and sheep being fed from time to time upon the blade while young, and when they most want it, the field may be afterwards shut up in the latter end of March, and the crop will be very great. The dung and urine of the creatures will so richly impregnate the soil that it will bear beyond what could be naturally expected; and the plants having taken great root during winter, will shoot amazingly, when they are permitted to rise to head.

Chance leads to most of these improvements; or the farmers like the chymists, while they seek for one thing find another: but by whatever means such discoveries are made, it will be wise to take the advantage of them for our future conduct. Certainly what has succeeded once, will, under the same circumstances, answer again; and no knowledge in farming is so useful as that which shews in what manner the crops may be most varied; and that not only in respect of kind, but of growth.

The soils upon which this winter crop of oats have been tried hitherto are light, gravelly, or chalky. I once observ'd a crop of them upon the border of the fens upon a light loam, which exceeded all that I ever saw from the spring sowing. The service of food for sheep, and certainty of a good crop afterwards, are very material articles.

Pease will come now into pod, and the farmer must watch his opportunity of cutting them. It is to be done when they have their full growth in the pod, and have begun to harden. In this case they get a great deal of good in lying on the ground; the pea swelling, and the flour mellowing within it. The haulm at this time has some power of conveying nourishment to the pods from the air, as plants receive it when cut from the stem, and set in water. If the farmer stays till the pease are hardened in the pods, he loses this advantage; for the haulm is too far dried to be of any service in this article.

Let him watch the fields of this pulse carefully, and not expect always to be reminded in time, by the abundance of the bloom; for sometimes the flowers fade as soon as they open, and consequently there is little shew of this; but in that case, the crop is usually extremely good.

When the pease are in the condition we have described, the only consideration is how best to cut them. The two implements for this service are the pea-hook and the scythe. When the crop stands thick, the hook does best; but where it is an indifferent produce, and the plants lie loose and straggling, the scythe makes quicker work, and very well answers the purpose.

A dry pea-harvest is a great advantage, for the least wet disposes the pods to open, and the pease to fall out. The way to guard against this mischief, is to take care they do not lie in the wet; for it can do little harm, unless it hangs upon them. For this reason pease which get wet, while they lie upon the ground after cutting, must be turned often, and lightly shook up. The motion in turning them will throw off some wet, and the winds will dry away the rest. The whole haulm will also, by frequent and light turning, be kept from dampness; and this is a material article, while the crop is obliged to be left upon the ground. A wet season at cutting therefore entails a great deal of trouble upon the farmer; but he must submit to this, or to great loss.

There remains a great care after all this, with regard to such pease as have been exposed to this unfavourable weather when cut: this regards the inning of them, as the farmer calls it; that is, the getting them home, and mowing them up.

The more wet they have been exposed to, while they lay upon the ground, the more danger there is of their getting mischief when they are mowed. Sometimes they will absolutely rot and sink if they be put up carelessly.

The hogs like them the better for having been wetted in the



the field, provided good care be taken of them in the barn or stack; but if they become damp, and rot there, they will not touch them.

This is a very ticklish article. The wet which falls upon pease, after cutting, may be of great advantage to them, if it be not too great a quantity, nor too long continued; and if the due care be taken, that the pease in their pods be well dried again after their swelling, before they are put up; but if any of this management be omitted, or lightly performed, there is the greatest danger of their getting damage.

The horse-bean comes naturally under consideration after the pea, and indeed it is no bad practice to sow them together; they will be of great mutual advantage to one another. The bean stalks will support the pease; and the haulm of the pease, as it trails upon the ground, will shade the roots of the beans, and mellow the earth about them. There is also another essential reason why this should be done, which is, that these two crops approaching more to garden than field herbs, are liable to many accidents upon the ground; and those things which affect one kind, do no harm to the other. Some years pease in general fail; and other year's beans come to little: but the seasons and accidents which affect the one, have no force upon the other: therefore when they are sown together, there is the double chance of succeeding; for if either fail, there will be the more nourishment for the other, and consequently the farmer will have his due produce one way or other from the ground.

When horse-beans are planted alone, the best way of cutting them is with the scythe: but for this there should be early preparation made on the management of the ground. The field should be laid level by rolling; and the work in harvest time will then go on regularly and well.

Rolling the fields of beans has indeed so many advantages independent of this, that it should never be omitted. The earth is apt to be broke too much by their large shoot, and often from that accident it will lie loose about them for a considerable time, and hurt their growth. The rolling presses it firm to them, and prevents this accident.

There is a small brown slug that often makes great havoc in bean fields, while the crop is young; this also is altogether prevented by the beneficial practice of rolling: for the slug is killed, at the same time that the earth is pressed to the roots of the plants. For this purpose the rolling must be performed early in the morning; and there is no growth of the bean in which it can be done with safety, but while very young; for when the crops have any strength, the stalk would be crushed, and would not recover. Therefore this operation should be performed in a dewy morning, at sunrise, when the beans are about one inch out of the ground.

The vulgar practice is to roll the ground as soon as the beans are sown. This answers the purpose with respect to mowing, but nothing more. It is as cheap and easy to do it at the time here named, and take the advantage both of the pressing the surface flat, and serving the crop. The cleanness of a crop of beans is a great advantage at the time of mowing; and this must also be provided for in time. The practice of some is to hoe between the beans; but there is an easier and cheaper method. The principal weed that infests the bean crops is charlock: sheep are fond of this, and they do not regard beans. If these animals be turned into a bean field in May, they will not hurt the crop; and they will clear away the weeds very perfectly.

Whence a crop of beans have been thus carefully and regularly raised, there will be little trouble in cutting them; the scythe will very well answer the purpose; and this is an implement that makes quick riddance.

In some places they use the hook and swipe: the reaper, in this way, pulls a handful toward him with his left hand, and cuts them with his right; and though it appears an awkward and difficult business at first, yet practice will bring these people to such dexterity in it, that one man, if the crop has been drilled, will cut an acre and half in a day.

Very rich crops of beans may be sometimes reaped as wheat, and very poor ones must be pulled up by hand; but the general and best practice is mowing them with the plain scythe, a boy follows the mower, who throws them up in heaps: they afterwards lay all these along the ridges of the lands, and dry them gradually, and with very little trouble. Where the crop is not of the strongest kind, the expence of this may be saved by mowing the beans with a scythe, and a three-ribbed cradle. This lays them regularly, as they are cut.

The value of a bean crop is not sufficiently known; for the farmers do not venture upon a proper management.

Let the land be dunged and well dressed for horse-beans, and it will not be difficult to obtain forty bushels from an acre. The land is afterwards ready for wheat: for though the beans have had great advantage from the dung, they have not exhausted its virtue: they root slightly, and wheat may be successfully sown upon the ground immediately, without dressing.

Let the farmer remember that his stubbles will be soon ready for the pigs, and let him prepare for it accordingly, by weaning them from the sow. They will bear this very well at six weeks growth, which is a natural age for them at this season of the year; and a little tar rubbed upon the teats of the sow, will soon cure them of going there for food. They will feed very well upon following the sow into the stubble; and this early weaning them favours another litter of pigs, by preparing the sow for boar again.

Many other of the lesser crops now come in for cutting: the end of August is their great time. Canary seed is one; and as the market is not over-stocked at present, it answers very well. It requires little trouble in raising; the reaping is generally the work of the scythe, and comes cheap; the haulm is naturally dry, so that it makes easily into a condition for thrashing. And the market price of the seed is a very good one.

Cows are fond of the straw of this crop; and to favour its use, the plant should be cut before it is perfectly dry. The seed will harden sufficiently, by lying a very little time upon the ground.

As the TEASEL begins to ripen its heads, cut the stalk half through, a little below them. This will prevent an abundant supply of nourishment, at a time when they do not want it; and they will dry the sooner. This also is a more profitable crop than many farmers are aware; sixty heads or more are often produced upon one plant, and there is a market for them abroad as well as at home. Indeed it would be very much our interest to keep them at home, as well as the several other articles which concern the cloth trade. Nature seems to have put this into our hands, in preference of all the kingdoms of the earth, and we are very blameable for having let it, in so great a degree, slip out of them. It should seem as if Britain were determined by nature for the cloathery of half the world; not only our wool is fine, but the lesser articles have an excellence they reach no where else. Our fullers earth is essential in the highest degree; and these teasel heads which serve as a kind of natural brushes in preparing the cloth, are produced in an excellence that they have no where else. We are thus furnished with the means of a manufacture, almost as essential to life as food; for certainly cloathing is the next thing after it: we have thrown it into the hands of those who cannot half so conveniently perform it, by our want of attention in the higher classes, and of integrity in the lower. Let the farmer learn from this example, to regulate his own conduct, and not attempt to add a little to his present gains, at the expence of his reputation.

Cut flax this month, judging of the due time by the firmness of the stalk, and of the seed vessel, and let a great deal of care be taken that it gets no damage upon the ground.

The clover fields intended for seed, which have not been mowed for a first crop, but fed in spring, and then made up, will now be fit for cutting.

The common way of cutting clover is with the plain scythe; and where the crops are but indifferent, this may be right, but in a well managed clover field, that is now to be cut for seed, if the plants are high, and the growth tolerably regular, the best method will be to do it with the scythe and cradle, in the common way. With the plain scythe a great many of the seeding heads are cut thro'; and the crop is left so irregular upon the ground, that there is a deal of loss in making it up. But this way with the cradle every thing is performed with regularity; the plants lie even, and there is no difficulty in their management, and very little loss.

The third week in August sow the last crop of turneps. If they succeed, they will strengthen themselves very well in the ground before the cold; and if they fail, the damage is not great, for the same land will be in a very good condition to be sown with some of the winter corn.

The crop of turneps which were sowed the last month, will now require hoeing. And the hoer must thin the plants, as well as cut up the weeds. The busy time sometimes makes this neglected; but the consequence is either the utter loss of the crop, or its coming to very little. The heat is great at this time; and there usually want rains. Though it be a useful season for seedling crops, it is not a natural one; and whenever the farmer makes free with the



the common course of nature, he must take double care. If the plants stand too close, at the same time that they want the supplies of showers, they will come to little good, under this double disadvantage. The thinning them is necessary, because the supply of nourishment is small, and the breaking of the surface with the hoe disposes it to receive the dews the better, and to keep moister about the roots.

Sow coleseed also this month on stubbles.

Just before the cutting of peas, sow clover on the ground: it is an odd practice, but rational enough when duly considered, and the success has been found to answer perfectly well. The ground is very mellow at this time, because it has been so long covered by the haulm of the peas. The clover seed, if it be scattered by hand upon the land, while the pea crop is growing, will find its way to the ground, because it is small; and the reapers will tread it sufficiently into the earth, as they perform their work. There is no way of sowing so easy, nor any that answers better.

Turneps may be raised in the same manner, and with as much success. Scattering the seeds over the ground among the peas, before the reaping: they will in the same manner be trod into the ground, and the soil being so mellow, there is very little doubt of their success. Experience shews, that these kinds of crops rarely fail.

Often, when both the clover and turneps which have been sown in the common way, have come to nothing, these have succeeded, and been the great resource of the farmer in those articles.

The land that is preparing for the autumn sowing of wheat, must now be plowed, to get into good condition; and if it be a stiff soil, the best method is to lay it up in sharp single bouts. This, after the preceding plowing, will probably finish the work. These repeated plowings have from time to time more and more broke the soil, and it will, by this last operation, be thrown up in so excellent a manner to the sun and air, which are both powerful at this time, that it will moulder on the ridges, and be soon brought into a fine and perfect tilth, such as is necessary for receiving the wheat seed. This is very essential in the farmer's care; for though these stiff soils require all this labour and attention to bring them into the due condition, for receiving the seed of wheat, yet when they are thus prepared, none support it so well.

This is a good season for plowing in the green vetches into the ground, for preparing it for the winter corn. The cattle may be turned in about the middle of this month to eat off the head of the crop; and toward the end, the remainder should be rolled flat to the ground, and then plowed in. Care must be taken in doing this, that the stalks are duly covered; and they should lie thus to rot about three weeks: then the wheat or rye should be harrowed in, and the ground will be in so excellent condition for promoting its first shoot, that there will be no doubt of its being made with strength. More depends on this particular than the common farmer is aware; for when the first shoot is poor, there is no great hope of the crop, unless very particular care, or very favourable accidents assist it.

Clover may, in the same manner, be plowed into the ground at this season with success: but the best method is to assist it farther by the addition of some manure. Thus a very poor soil, which has a tolerable crop of clover upon it, if some dung and soft mouldered chalk be strewed upon the clover, and then the whole be plowed in together, will produce a vast plenty of wheat. In this case the clover should be plowed in about the end of this month, and should lie near a month to rot in the ground, after which the wheat is to be harrowed in.

The middle of August is a very favourable time for drying those milch cows which the farmer intends to fatten. They are to be turned into good pasture; and if they do not get this way into good condition, they must be stall-fed to finish them.

This month, as fast as the inclosed corn fields are cleared off, turn in the cows, together with the hogs; they feed upon different things, and do not at all interfere with one another. The grass and weeds upon the banks and edges are the food of the horned cattle, and the scattered corn of the hogs.

After these the domestick fowls should be put in. They will find a great deal that the hogs have left; and will produce a fair profit to the farmer.

## THE

## HUSBANDMAN'S KALENDAR.

## MONTH THE NINTH.

## SEPTEMBER.

**C**LEAR off the stubble fields as soon as that can be done without injury to the crop; that the cattle, and the rest of the flock, may have the advantage of feeding on the scattered grain and pulse. The sooner these are turned in the better; for if it be any time neglected, the wild birds of all kinds take the advantage, and it is not the farmer's business to give these a habit of coming into his ground.

This month the farmer is to begin sowing of wheat; and he may continue it as occasions require, or as the circumstances of his farm direct, during this and the succeeding month. Let him remember that it is on this crop his principal dependance is placed; and take all due care in putting it into the ground.

Some land, we will suppose, has lain fallow for it the whole season: we have from time to time directed the farmer in the management, which will turn that fallowing to most account; and he is now to sow.

The seed corn must be purchased with care; examining its soundness; and the farther off the farmer's land it grew, the better. Let it be steeped carefully, as we have directed in the preceding volumes; and all light corns skimmed off and thrown away, they would only deceive the farmer, for the principle of vegetation is lost in them.

Beside the fallowed land, there may be ground in many other conditions, naturally and properly sowed with wheat this month; or dressed in such manner, as to prepare for sowing that grain the next. Clover lays are of this kind; and other artificial grass ground. Pasture ground, that is intended to be brought into tillage, is also now to be plowed up for that purpose: and on this occasion, no implement answers like the four coultered plow. One working with this will serve the purpose of three with any other plow, because of the number of the coulters by which it cuts the turf all to pieces, and destroys it at once.

Where a clover lay has been turned up for wheat, and the clover plowed in after the wheat is sown, it is an excellent method to fold sheep upon it, piece by piece, till the whole surface has had them upon it, and has been dressed in this manner by their dung, urine, and perspiration. This has the advantage we have so often named to the farmer, arising from a mixture of manures: the clover, which has lain to rot in the mellow soil for a month, proves an excellent vegetable manure; and the folding of the sheep upon the surface, adds a very rich and fine one of the animal kind: these join their effects in promoting the first shoot of the seed, and sending it up with vigour; and we have explained before, how great advantage it is to any crop, to make the first shoot well.

If the ground be suspected of slugs, let provision be made against their damage, by adding to the ingredients in which the seed is steeped, copperas and nitre, in moderate quantities. The effect of these is very great in assisting the first shoot of the corn; nor is it a little service, that they render it disagreeable in taste to these mischievous devourers. If these be not sufficient, it will be proper to mix a little flour of brimstone with the lime which is sifted over the seed, after it is taken out of the brine. This never does any harm to the growth, and it is so distasteful to many creatures, as to be an excellent preservative.

Something there is in the use of copperas on this occasion, which brings into suspicion the doctrines of that excellent writer, Dr. Home. But when experience is on the side of what we direct the farmer to do, the most respectable names should not prevent us.

What is called copperas is the salt of iron; the name has led some to suppose it the rust of copper, but that is a mistake: the rust of copper is called verdigrise, and is a poisonous substance, and not meant in these receipts. The salt called copperas is made from a vitriolick mineral, called pyrites, containing iron; and the copperas itself is the same thing with the salt of iron, obtained from iron itself, by any other means. Dr. Home considers iron as a poison to vegetables: now we have observed, that on the contrary, iron makes a part of all vegetables: and it ap-



pears by the use of this salt of iron in the liquor, wherein seed corn is steeped, that far from destroying vegetation, or acting as a poison to the plant, it not only defends it from insects, but promotes its growth.

When we see uncertainty in the writings of the most ingenious, it should learn us to be modest in our opinions: we see the same thing in different forms, may have very different effects upon vegetation.

The best kind for sowing upon the clover lay, is the red perky wheat. It succeeds better than the red lammas. Less of the seed will answer the purpose, because this produces more stalks from each root; and the price it brings to market is nearly the same.

When the seed is harrowed in, the farmer ought to have a watchful eye over the business: for the purpose is to cover the seed without raising up any of the roots of grass or weeds, which had grown among the clover. The more harrowing is used, the more danger there is of this; but so much must be allowed as will cover the seed. Let the ground be harrowed twice or three times lengthwise, and let him observe whether this raises enough of the mould for the proper covering of the seed corn: if it does, let there be nothing more done in this matter. If this do not raise enough of the mould, it must be harrowed crosswise. This must be done with great art and care, for it is in this the danger lies, of pulling forth the roots of weeds, which will by that means be set to growing.

When a piece of rich ground has lain two years in clover, worms are always very plentiful in it; and they will prove mischievous to the crop of wheat that is sown upon such ground, if care be not timely taken, and the proper ingredients used in the steeping and sowing. The most secure practice is this: mix copperas in the liquor wherein the seed is steeped, and strew some sulphur over it with the lime. Then for a top dressing, after it is in the ground, sprinkle a good quantity of lime and foot. The worms will be destroyed by this, and the ground at the same time enriched.

The sowing wheat upon a plowed stubble, is a practice for this season of the year, but it is so hazardous, that we can scarce recommend it to the farmer. If he will venture upon it, let him take the proper caution.

No damp land can by any means bear this management. The soil must be light and dry, and it must have good tillage, and very sufficient dressings. The most advisable method is, not to dung the land before the sowing, but immediately after. Thus let the stubble be plowed up, the seed harrowed in; and then bring on the dung, which must be rich, fine, and well rotted. This must be spread thin upon the land as soon as the seed is in, and thus lie till it rots away, the rains carrying the very substance of it into the ground. The dung warms, and at the same time covers the ground; it keeps off the effects of the cold from the crop at its first coming up, and at the same time enlivens the shoot. This is the most certain method.

Wheat in rich and dry lands will succeed very well upon a barley stubble with due care. The method is this: as soon as the barley is off the ground, plow up the stubble in broad lands, and let it lie three weeks, then harrow it plain; after this plow it into broad lands again, and then harrow in the wheat seed.

This season sow wheat also on the pea stubble; there is nothing wheat follows better than pease, but care must be taken to refresh the ground in spring by a top dressing, while the wheat is growing. A mixture of scot, lime, and pigeons dung is excellent for this purpose, or other kinds may also be proper, according to the nature of the soil; and the farmer will find directions for his choice on all occasions in the preceding chapters. By one or other of these methods he is to keep up the spirit and vigour of the growth in spring, and he needs not to fear having a very plentiful crop. If the drill and horsehoeing husbandry be used, the success is yet more certain: for by this practice a great degree of strength and vigour can be given to the crop, not only while it is under the first state of the summer growth, but throughout the whole time. For the turning up the intervals between the rows, during the growth of the crop, in that method, acts as a dressing of any of these ingredients, for the time. And has the advantage over them, that it can be repeated throughout all the season of the growth, which no other can.

A bean stubble is another excellent kind of ground to be plowed up in September for the sowing of wheat. Pulse, though they grew large, do not exhaust land in the manner of corn. Their spreading leaves and branches cover and shade the surface, so that the ground is mellowed, and weeds are not permitted to grow upon it. All the time

the crop roots slightly; and receives more of its nourishment from the air than from the earth, so that upon its being removed, the ground is in good condition for this principal growth, the wheat. These lands will require no more at this season than once plowing, and then harrowing in the wheat; but in the following spring it will be very proper to assist the young crop, by a top dressing of some of the fine light and rich ingredients. This is the method of raising wheat in perfection, upon the stubble of another crop. It is of great advantage, because it places an advantageous growth, instead of a year of fallow.

This month sow rye, and chuse for it the proper soils, loam, chalk, gravel, or sandy ground. On any of these soils, when the farmer doubts there being in a condition to produce wheat to advantage, let him sow rye.

The earlier in autumn this is got into the ground, the better crop may be expected from it; for the damage which most affects rye, is the chilling of its roots by the first frosts. The better strength they have got in the ground, the more able they will be to bear this, and their leaves will be a defence to the roots, if the seed have been put into the ground in such season that they have made some shoot of tolerable strength, by the time they are wanted for that service.

The farmer may sow rye for two uses, the seeding his cattle in spring, and the standing for a crop at harvest. If he separates these two articles, the season of the former should be earlier than that of the latter purpose. Rye that is sown to raise food for cattle, should be got into the ground in August; and that for a harvest crop in September. But there is no need to keep these two articles separate. I have shewn that corn may be fed very freely while in the blade, and yet will make a good harvest if shut up in time, and this is plainly what the farmer should attempt. If he manages well, the cattle will do good instead of harm; and by laying up the field at a time when it has done the best of its service in feeding, it will yield very plentifully at harvest.

Rye succeeds well upon the most loose and brittle soils, if the farmer will allow it the advantage of a folding as soon as it is in the ground. In this case the feet of the sheep tread down the loose soil, and fix it so well about the seed, that it keeps a good hold during the growth, and at the same time the land receives a rich dressing from their dung and urine, which does not evaporate at this cool season, as it would in the heat of summer; and the corn wants it: for the growth of rye is very large; and the more the ground is enriched in the beginning of its growth, the fuller will be the crop at harvest.

Sow rye now also upon a turnep ground that has been eaten off, and there will be the double advantage of two crops in the place of one, upon the same land; and the strengthening of the rye by the dung and urine of the sheep. The proper method is to prepare for this in time. Sow Dutch turneps in May, and they may very well be eaten off by sheep by the last week in September. And at that time the rye may be conveniently sowed. The ground will be rich, and the crop will shew it in its first growth. I have observed, that rye sown after turneps in this manner, succeeds better than in almost any other course.

Steeping of rye seed is a very proper article in the management of this grain; and the later the seed is sown, the more necessary this is. The best receipt is to dissolve salt petre in water, and pouring it on the seed, after a little time, to add the black or red water that runs from dung-hills. Experience shews this strengthens the first shoot of the grain.

Toward the end of this month sow the winter vetches; they will be ready at an excellent time in spring: they will come in for seeding the cattle after the turneps are over, and before there is natural pasture.

The large kind, called the gore vetch, which is particularly excellent for feeding horses, should not be sown in autumn; for it is tender, and the chance is equal whether it stand through the winter or not. I have seen it succeed, and I have seen it fail: but as the mildness or severity of the winter alone are to determine in this respect, and as these cannot be foreseen, it is idle in the farmer to run the hazard, because the other kinds will answer the purpose, if not altogether so well, yet in perfect security.

The last week in September take potatoes out of the ground: they will have their full growth by this time, and any longer keeping them in the earth, throws them needlessly in the danger of frosts. They may be preserved during the winter, in dry trenches lined and covered with straw, and headed with a ridge, and will thus be always ready for market.

The potatoe is at all times a valuable root; but as we

seem



seem now threatened with an artificial scarcity, or at least with an extravagant price of corn, which they who should prevent, support; there is double reason to consider it. This root in a great degree answers the purpose of bread to many; and a better way than depending upon it entirely, is to mix the meal of it with flour. Equal quantities of these wrought up in the common manner, make a wholesome and good kind of bread. It is fit the poor should be reminded to take care of themselves, when those who should be their protectors oppress them.

The stubble fields will now serve as a resource to the sheep. The best method of managing them is to turn them first into one, and then into another; not letting them eat the grass, they find them too close; but giving it time to recruit a little, while they are going the round of the several fields; so that the first they were put into may be a little recruited by that time they are taken out to the last.

By this method they will be found in food till the forward sown turneps are ready to feed.

This method fattens them up early for the butcher. The proper age of the sheep is shewn by their having six teeth; for when they are younger, they will not fatten near so readily.

## THE HUSBANDMAN'S KALENDAR.

### MONTH THE TENTH.

#### OCTOBER.

THE business of the last month may be naturally and properly continued into this; and whatever was begun in that may be finished now; or whatever has been omitted then, may be now done, taking for this purpose the first week, and providing accordingly.

Continue sowing wheat this month, but the earlier it is got into the ground the better. Different accidents may influence the farmer in this particular; but he should always get his wheat into the earth, as soon as the nature of his affairs will permit. The farmer knows the value of his wheat will depend upon the fineness of the flour it yields; and the name of Hertfordshire white is very well known among all dealers. This is the produce of the red lammas wheat; red in the stalk, ear, and skin of the grain, but whitest of all in the flour. This is a reason that the farmer should prefer the red lammas wheat to all other kinds, not only for its real, but its received value; but there are particular soils which other wheats suit better, and there are some kinds which come so near this in its qualities, that the difference in price is small. And in these cases it must be the best course for the farmer to chuse these.

In gravelly and chalky soils, he should sow the pirky wheat. The lammas requires a more firm and sound earth. This perks or perky wheat is shorter in the growth than the red lammas, and its stalks and ear are white, but the grain has a red skin. The flour is very like that of the lammas.

There is another kind between the two in value, and it requires in the same manner a soil of a middle nature between one and the other. This is the yellow lammas: if the farmer has a gravelly soil where there is a great deal of loam among it, this will succeed excellently. The yellow lammas is so called from the colour of the rind of the grain. The stalk is white, and the ear is reddish and shorter than the red lammas. The flour is of a very good colour, but this kind of wheat is apt to run too much to bran.

These are nice distinctions, but they are absolute: and the thing is of so much importance, that it is very well worth the farmer's while to attend carefully to them.

In light soils, inclining to sand, the white wheat succeeds better than any of these: this is an excellent kind. It does not grow so tall as the red lammas, and the stalk and ear are white: there are more husks about the grain than in common wheat, and the ear is thicker, and when ripe, looks rough. This kind yields an excellent flour, and in great quantity; it is considerably different from the others, and the difference is very obvious to the eye. It is therefore easy to propagate it; and there is none of

all the kinds of wheat that is so well worth the farmer's regard.

If the farmer have a tough soil, in danger of more wet than is agreeable to wheat in general, let him chuse, when he must sow wheat upon it, that particular kind which is called duck-bill wheat, and grey pollard. This is a bearded wheat, with a large thick ear. The chaff is useless, but the flour is excellent for common service. It will bear more damp than other wheat, but it requires the soil to be in very good order, and it must have its full time in the ground; the latest it should be sown is the first week in October, and the latter end of September is better. This wheat sells for less than the before-mentioned kinds, but it produces more in quantity than any; so that the large produce makes amends for the lower price. The farmer who sows this on such land as we have named, will make considerably more profit, and with less hazard and trouble than he could from the same piece with any other.

The mealmen know how to mix one third of this with two thirds lammas, and the flour is very good; it will also bear tolerably well in an equal proportion: but for family service it is very good alone. The great duck-bill wheat, with the kernels in four rows, instead of two, is another excellent kind for heavy lands. The produce is very great, but the weight of the ear makes it in danger of lodging, especially if there be not due toughness in the soil. The stalk of this wheat is brown, and the ear is pale or whitish. It is a very profitable wheat, but it requires the soil we have named; and that it should be well in heart; for it draws a great deal of nourishment: nor can it be supposed that this great quantity of grains can be supported, without a great deal of food. To raise it in perfection, let the strong land that is fit for it be got into a fine tilth by the end of September. In the very beginning of October let the seeds be sowed, and immediately after let the ground be lightly folded. This will encourage the shoot, at the same time that it presses the earth to the seeds, and disposes them to take good hold of the ground.

The best way of sowing it, is by the drill husbandry.

Upon a dry loam the double ear'd, or many-ear'd wheat succeeds very well: this has two or more ears upon the stalk, and there was a time when it was supposed therefore to be doubly profitable: but farming is better understood now; and we know that the best land can feed but a certain quantity of wheat, whether it grow by two ears or by one. There is no real advantage in the double growth of this kind; and the farmer needs not regard it, otherwise than as it suits this particular kind of land.

For the finest, richest, and best prepared land of all, we shall recommend to him that kind of wheat, which from the thinness of the rind of the grain, has obtained the name of eggshell wheat. The flour of this is excellent, and it yields a large quantity. The wheat is of middling growth; the stalk is of a pale yellowish hue, and the ear brownish: there is no flour comes up to this in excellence. The seed is to be procured from the Berkshire farmers, but they are not very ready to part with it. This is best sown the second week in October, and dressed immediately with a fold. The drill and horseshoeing husbandry raise it in the greatest perfection, but it will stand as well as any wheat in the common methods.

The end of October is as late as any prudent farmer should keep his wheat out of the ground; but accidents may sometimes compel him to submit to what his judgment disapproves. The chalky lands will bear late sowing better than the clayey; and he should manage his affairs accordingly.

A great deal of mischief is frequently done to wheat by the grub. This is a white worm, with a hard red head, and six legs. It is bred from the common beetle, called the cock-chaffer, and will live through the winter, if undisturbed; and frequently eat off the corn just above the root. The mischief they do in grass grounds is the same; and the farmer has no worse enemy, when he suffers them to multiply upon him. This creature naturally resides just under the surface of the ground, and consequently any turning up of the soil discovers it. The farmer should observe whether there appear many of them in the field he is about to sow with wheat; and if there be, he should set about their destruction with care. The roller is the proper instrument, for their bodies being soft, are crushed, and entirely destroyed by it; and they become then a manure to the ground, the fruits of which they would otherwise have devoured. The rolling should be performed soon after the seed is in the ground, and it will do nothing but good; pressing the soil, fixing it to the grain when it is about to shoot in an advantageous manner.

Let



Let him next examine his pasture grounds, for the same devourer. These creatures are better concealed there, by lying among the matted roots of the grass; and they do so much mischief, that it is very well worth while to be at some expence to destroy them. They are most common in such pasture land as is most neglected; where there are bushes and anthills, and where their great destruction, the roller, does not come.

If the farmer finds his grass very deficient in such pasture, beside the natural causes owing to his neglect, in suffering those incumbrances upon the ground, let him turn up here and there a piece of the surface, and examine among the roots of the grass, probably he will find many of these worms in some places. They are in a manner innumerable, and if any good be hoped for the future from that piece of ground, they must be destroyed. This cannot be done without tearing up the bushes, and cutting up the anthills; but this also is necessary to the improvement of the ground, and the expence will be very well answered by the following produce.

When the ground is cleared of these incumbrances, let it be very well rolled with a heavy roller, and this repeated several times. Let a mixture of lime, ashes and foot be used as manure, and scattered over the ground tolerably thick, when there is a prospect of rain. It will be an advantage to roll the ground as soon as this is on, because it will prevent the best virtues of it from evaporating, and will force it more down upon these creatures.

By these means the grubs will be destroyed, and the ground at the same time greatly improved. Some hayseed should be sprinkled on the bare places, and by this way the next summer will yield a crop of hay very different from what has been used to be had from that land.

Let the farmer next look over his meadow land, and see where it is most apt to detain the wet. This is a season when the rains will give him an opportunity to know, for water is the best and surest level. The importance of raking off an abundant quantity of moisture from land that is for grass, is as essential as in that of tillage; for in this case it always produces a very bad kind of grass of a rushy nature; and often rushes also. The lowest part of the ground will be seen in this case, by the stagnation of the greatest quantity of wet: and we have, in the preceding volumes, told the farmer how he is to discharge it.

Where marle is to be used upon grass land, this is the time of laying it on. Let it be scattered at distances over the ground, and left for the winter frost, and rains to break and wash into the ground. It will be of great advantage in the use of these manures, for the farmer to send in a labourer two months after they have been laid on, with orders to break the lumps, which will then be easily done with a back blow of the spade, and to spread the matter more evenly and perfectly over the ground.

Chalk is sometimes useful as a manure on grass lands. In that case the soft, tender chalk should always be used, and it should be spread and broken in the same manner.

The fields of artificial grasses which are planted for the horsehoeing husbandry, are now to come under the like management also. Mr. Tull has said, that no manures are necessary for these crops, where there is due tillage used; and in some degree it is right. The crops will be very well supported by good tillage of the broad intervals between the rows of them; but the ground is to come into other service afterwards, and it will be best prepared for that by a due use of some of the manures, a little before the time.

Therefore if a lay of saintfoine or lucerne planted in this manner be intended to be broke up the next season, it will be very proper at this time to spread over the surface some of the manures which require the winter's weather to break and moulder them, and are not liable to be exhausted by the air.

Chalk and the like are of this kind; and if they be laid on now, and left to the air and weather, a part of their virtue will be gradually washed in; and the whole substance of them will be soon after mixed with the soil, by the succeeding plowings. Thus it will be very well blended with the mould, and exhausted by no weeds. And in consequence of the repeated tillage, the land will have the full advantage of manure and fallow.

As we suppose the artificial grass to be near the time of breaking up, its roots are sent deep into the ground, and so little of the nourishment drawn from the superficial part of the intervals, that very little of the virtue of the dressing will be exhausted that way. The old roots will be so far invigorated, as to bring in a very good produce for their last crops; and the soil will be in a very perfect and ex-

cellent condition, when it is broke up for the produce of another growth.

If for any particular reason the farmer chuse to continue the same crop on this piece of ground, still this management is useful: for the old roots, being past their best service, should be destroyed, and a new plantation raised in the intervals, to be ready for service, when the old are taken up.

This has the same advantages with a new piece of land; and the parts where the old crop grew, being thus made the middle of the intervals between the new ones, are put into a state of fallow, and recruit again.

This is the advantage of the horsehoeing husbandry above all other kinds; and by this means land is kept always in a state of service: Mr. Tull says, without manure; whether that be the case, I will not positively say; but with a very little manure it certainly is so.

As the leaves decay, this will be a time to look to the fences. It is too much neglected; and the proverbial remark is in nothing more true than here, that a little timely care saves a great deal of trouble. The gaps in fences, if neglected, soon are enlarged; and that which might be stopped with little trouble, when first made, becomes very mischievous afterwards. This is the time to look over and see all is right; and he who will do this regularly, will save himself a great deal of future expence.

The season is now come also for plantations of many kinds. The acorn must be planted now, for it does not keep good any time; and the seeds of many other trees and shrubs succeed better at this, than at any other season.

In young woods, let the hedges be a part particularly regarded, for cattle are fond of the shoots of trees, and the season is coming on, when other food being scarce, they will be tempted to gnaw them; and the damage is almost irreparable.

## THE

## HUSBANDMAN'S KALENDAR.

### MONTH THE ELEVENTH.

#### NOVEMBER.

**W**H E A T may be yet sown in several kinds of land: and frequently the farmer's private affairs do not permit him to sow sooner. Let him manage accordingly, and he may succeed very well; but carelessness may make it very hurtful. The common choice in wheat seed falls upon the lammas kind; but this is not the sort that is fit for putting into the ground now. Either of the lammas kinds will be in danger of blights and mildews, if sown so late; the proper kind for November is the perky wheat.

If the husbandman finds he cannot get his stubble grounds in order for wheat in October, let him not sow them without farther care, but continue his labours; and in this month put in that seed which is proper for the time. We cannot advise the sowing of a clover lay so late as this with wheat; but on the other lands, with due care, there is no danger. The weather must also, in some degree, direct the farmer; for if it be very wet, he should sow more seed in proportion, as some will be lost. The lighter soils are fitter for sowing so late as this, than the heavy; and the latter, if it be necessary to put in the seed at this time, should be dressed with so much the more care to prepare for it.

The white clay, and the soils which approach to the nature of chalk, succeed very well at this season of sowing; but they require some care of the seed afterwards. The very best management is to lay on a coat of a very well rotted dung, when the seed is in the ground; for this is a season at which there is no danger of its being evaporated by the heat. The rains will wash it in, and it will serve, in the mean time, as a shelter and defence against the cold.

Some of the turnep fields may be conveniently eaten off, and sown with wheat this month; and this, if there were no other, is a reason for the sowing as late as November.

The larger cattle may be fed as well as the smaller, to clear the ground for this purpose; and the perky wheat will be the properest choice in this, as with other articles.

With regard to the sleeping and brining of wheat seed, the advantage



advantage is very certain; and very well known; but this, like most other articles of husbandry, is practised too inconsiderately.

Regard should be had to the condition of the ground in the soaking of the seed. The ingredients will give their virtue, whether the wheat have lain in the liquor a little longer, or a somewhat shorter time; but the seed will be suited better or worse to the ground, by its greater or less degree of dampness.

The drier the season, the less soaking the wheat seed will require; and the wetter the ground is at the time of sowing, the damper the seed may reasonably be allowed to be. If very wet seed be put into ground that is perfectly dry, it will be in danger of decaying in the very act of making it shoot. There is, on the other hand, no danger in putting the seed dry into the ground when wet; but there is, on the other hand, a very great advantage in being able to impregnate the wheat so strongly, as that may be done with the virtue of the steeping ingredients, without danger of its decaying.

The farmer is to learn, from this true state of the case, that although it be to his advantage to steep seed thoroughly in wet weather, when the ground is in such a state, as properly to receive the grain in that condition, yet he must not do it so freely, when the soil and season are dry. The corn on these occasions must lie a less time in the brine, and the lime must be sifted over it in large quantity.

Oat stubbles may be this month sown with wheat; provided this has been the original intent of the farmer with his oat crop, and he has taken the care of dunging the ground, before the oats were sown. This is a practice used in many parts of England, and it is a very good one. The oat does not greatly exhaust such a land; and weeds, which are too often the consequence of dung, rise among the oat crops, and are destroyed before the sowing of the wheat. Upon all considerations, this is found to answer very well, for the oats are sure to be a very fine crop; and the dung remains in vigour in the land. The plowings that are necessary for preparing the stubble for wheat, never fail to bring it into a great heart, and the succeeding crop is a fine one.

Plow up the land intended for the spring sowing with pulse. A wheat stubble, with proper management, will be extremely rich for this purpose by March.

Clover may also be sown in the same month, upon a land which has born wheat the preceding season; and oats will succeed equally well: for all these the ground must be very well wrought now; and the success then will depend upon the present management.

The blue pea, which is cultivated to great advantage in many counties of England, requires also the ground, if it succeed a wheat crop, to be plowed now; and the hog and maple pea will succeed. Farmers know the advantage of change of crops; but they do not attend to it sufficiently. If they would allow the due care to the lesser kinds, these would often yield them a profit much more proportioned to the greater. The dunging the land intended for oats, which we just mentioned, is one strong instance; and the giving sufficient tillage to the land intended for the pulse kinds in spring, is another.

Pease will come upon a clover lay with very great advantage; if the proper attention be allowed to them. The clover should be plowed in about the middle of this month, and thrown in broad lands. In this manner it is to lie till March, when it should be harrowed. Then half the pease should be sown under furrow, and the other half harrowed in.

Pease will also follow barley very well in the same manner. The stubbles should be plowed now, and laid up till March. The rains, snow and frost of winter, will mellow and improve the soil; and the pease sown in March, will have all reasonable advantage.

The land intended for beans is now also to be plowed; and the best time for sowing them upon a wheat stubble is in February, or at the utmost, in the first week in March.

Plow up also the wheat stubbles, which are intended for barley the succeeding spring.

Where pease have grown this year upon a stiff soil, the ground should be well wrought now for its first preparation; and it will, under the succeeding care we shall direct, excellently receive turnep seed the following May.

Where the crops of wheat that were sown early are now vigorous above the ground, it is an excellent management to give them encouragement to shoot more freely by a top dressing of dung. This should be repeated once in six weeks during the winter, and the first months of spring to those crops which want so much assistance. This must be done with more care, as the crops are more grown; but it

is an excellent method of preserving nature in a state of vigorous growth. Dung fresh from the stable may be used in winter for the purpose; and there will be no harm from its rankness. When the farmer has not had dung enough in summer to dress his lands for wheat, this is the more necessary; and the laying it on now will very well answer the purpose.

The business of folding may also be still continued to advantage, especially on gravelly grounds, which shew the least effect of the earlier dressings. The benefit that arises from this is evident; but the sheep often suffer for want of care, while they are performing this acceptable service. If they have not dry food in racks, they frequently fall into disorders. The best is hay, but good straw will answer the purpose. Only when sheep are folded upon wheat lands, it should be wheat straw, not that of barley or oats, for fear of some of the corn falling out, and growing up among the wheat. No care in thrashing will prevent a possibility of this; and therefore what grain is left in the straw, should be of a right kind. Hay of vetches will answer the purpose of this rack-feeding without damage; but this is best and richest of all, when it has been cut down for that purpose, at a time of the vetch being in its greatest perfection, which is, when it is covered both with flowers and young pods: the seeds in these being soft and tender, lose the vegetative power in curing the hay; so that if any of them should fall out of the pods, as the sheep move the hay in eating, they would not be in a condition to grow.

This is a material consideration in the rack-feeding of folded sheep. When the farmer is put in mind of it, nothing can be more familiar: but on these slight observations or neglects depends so much of his success, that he cannot be too careful. In the present instance, a negligent conduct may lose his sheep, or fill his wheat with oats and barley; whereas a moment's thought without a farthing more expence, preserves the cattle in health, and keeps the crop clear.

When wheat is to be sowed at this late season, and the land itself is not very favourable, as in gravelly or poor loamy soils, provision should be made for the assistance of the crop. There is a particular manure which answers this purpose beyond all others, in a November crop of wheat, that is to grow in a brittle or loose land; this is cows hair. It is to be bought at no great expence; and it should be scattered over the surface of the ground, before the last plowing, in the manner of seeds. This when plowed in will act many ways for the improvement of the crop.

In the first place, it is a very rich manure, and one that does not dissolve in the earth, so as to part with all its virtue at once: but every shower that comes on brings out a fresh portion of its particles, which assist vegetation.

Then it acts as hair in the making of mortar, keeping the other parts together. A great deal of danger would attend wheat on such a soil in winter, from the frosts cracking it, and exposing the roots of the tender crop; but the hair holds together the particles of loose earth, and in a very great measure prevents that accident. Its virtue lasts till the very time of harvest, assisting the growth of the plants, and filling the ear. The farmer who considers these numerous and lasting advantages, will not think the price of this ingredient misapplied.

If sheep are not required for folding upon the corn lands, they may now be used to the same good purpose for the improvement of pasturage. The grounds which want them most are such as lie cold, though dry, and are for that reason subject to be over-run with moss. The dung and urine of the sheep will do great good in these pastures, at the present season, because the sun will not exhaust their virtue, and the warmth and perspiration of their bodies assisted by the salts of their urine, will destroy the moss, while the general enrichment of the ground, by the washing in of dung, will produce grass in the place of that incumbrance; when the sheep have done their office, by folding on the corn, they may be with due care brought upon the pasture land; and to the careful farmer they will serve as an excellent assistance to both kinds of grounds, and be a profitable article also in themselves.

The care of the sheep must not be omitted in this consideration. They must not be ventured upon the pasture land in wet weather; and it will at all times be of service both to them and to the ground if some straw be scattered upon the place where they are to lie: the best method of all is to fold two nights upon the same piece of ground, and feed with dry hay; for dry gravelly pastures which lie high, and open to the sun, cow dung is at this season an excellent manure. These fields produce but a poor quantity of



grafs, because the roots of the turff are too much exposed to the sun; and the ground which is naturally barren is defrauded of that manure it might otherwise have from the cattle that feed upon it; because they always run for shelter about the hedges, and lie under them. There their dung and urine fall; and there the warmth and moisture of their bodies gives its assistance.

Cow dung is a proper manure for this kind of soil, because it is cool, and the soil itself hot: it will be better at this time of the year than any other, because the cows must have some dry meat given them as fodder, and this, in all instances, warms the dung of animals. They should be induced to lie in the middle of the field, by giving them their fodder only in that part, and they will keep there the more readily, because the sun is rather comfortable to them, than disagreeable at this season of the year.

By this means they will drop their dung and urine in the part where it is most wanted, and this at a time when the dung is richer than usual.

We blame the custom of earlier husbandmen, in planting trees in pasture grounds; but they were right in the practice, and it is only we who have done wrong, by not keeping up to their intentions. They planted these trees for the cattle to rub against. This and the shade of their boughs in summer, brought the cattle into that part of the ground; and they had the advantage of their dung where it was most wanted; which we have not, because we have left off that custom. They knew, as well as we, that the shade of large boughs hurt the grafs underneath them; therefore they trimmed up those trees accordingly, which they placed in pasture ground. They planted but few, and they kept them trimmed up and distant. Thus the cattle were tempted to them without damage of the grafs; and the several parts of the close became of the same value.

This is an excellent season for laying on other manures upon grafs ground, of whatsoever kind they be; and the great article is the making them fine.

The grafs being eat off by this time, there is no loss in the covering the grounds with the manure; and it promotes, in the most advantageous manner, the growth of the expected shoot.

We have named, in the preceding parts of this work, the manures and dressings proper for different soils; and the farmer may chuse among them. But in general the mixture of several sorts is better than any single kind for grafs ground. The proper ingredients are dung and pond mud, the rotten earth from under hay-stacks, and road dirt taken up from the staling places. These being mixed together during summer by frequent turning, should now be screened for service. This is no great trouble, and it takes out all accidental rubbish that may be among the materials, and even the roots of weeds.

The farmer's business is to keep his grafs ground clean and level. Every piece of stone or brick-bat robs him of so much grafs, as would grow upon the ground it covers; and every lump of hard matter, which rises above the general surface of the land, throws itself in the way of the mowers scythe, and prevents the cutting close. Weeds destroy more than rubbish, because they spread far, and shade a great deal of ground; and beside, what mischief they do by this, they exhaust the ground. A little expence for the labour is cheap enough; will prevent all this, and the next crop will repay it twofold.

This is the time of doing it, and let no part be neglected. Let the farmer first send in his labourers to draw up by the roots ducks mallows and perennial thistles. Let these be thrown out of the ground; and all accidental rubbish, boughs of trees, leaves, or the like, be taken off at the same time. If there be mole-hills, or other irregularities of the surface, let those also be levelled, and then let the manure, screened fine, be brought on, and spread regularly over the ground.

There is more trouble in this, we allow, than in the common slovenly method; but the advantage is proportioned in an ample manner.

The turnep crops will now come into excellent service for feeding. We have observed, that at this season the common pasturage is eaten down; and the turneps are the resource. Let the farmer use them properly.

Sheep should now be turned into the turnep fields where there is occasion; but this should be deferred as long as it can be, and the greater part of the turneps reserved untouched, while the sheep have what is necessary, and no more.

For this reason they should by no means be yet fed at large upon the field. The first frosts nip the leaves of the turneps; but vegetation is yet carried on very powerfully; and what cannot go to the leaves is given to the root, which

at no season encreases so fast as during these early and somewhat sharp frosts. From this condition of the turneps, the farmer will also learn another lesson, which is to put in his sheep at times when they will be best fed, and do least violence to the crop. Ewes with their lambs feed upon the tops of the turneps, preferring the green part: but weathers are fondest of the root. Therefore let the ewes and lambs be turned in earliest in the season, and the weathers into the same field, or the same part of a field afterwards.

That the turneps may take all the advantage of growing at a season which favours it, let the other fields be kept shut up while one is eating; or if the field be large, and the sheep few, let a partition of hurdles be run across, to divide it off, and the ewes first turned into their portion; and these being removed into a second division, let the weathers be put into the first.

The younger the turneps are, the more advantage they will receive by this respite from time to time, from the teeth of the sheep; and the older they are, the less benefit they get by remaining in the ground at this season; and indeed, when they are of very long standing, they get harm.

Turneps may be taken up at this time of the year, when there is occasion; and kept in holes dug in the ground in a dry soil, and covered with a ridge of straw, in manner of thatch. But they must not be kept in the large quantities together, as potatoes are.

If the farmer have fattening sheep as well as store sheep, he should turn the former first in, and the roots which they have scooped and hollowed, as they lay in the ground, should be picked up for the store-sheep, which being let into the same ground, will greedily feed upon them. In this manner, as also in the former management of turning in the ewes first, and the weathers afterwards, into the same piece of ground, it gets the advantage of a double folding.

If the farmer have large cattle to fatten upon turneps, let him take care in time, by sowing the right kind. The yellow turnep is the sort for this service. The cows and oxen will eat it any way, either under cover, or in the ground; and the sheep will freely come after them, so that there will be no loss. What the oxen leave in the ground, should be picked up for the sheep; and thus every part will be useful.

This remain of the turnep crop, as it must be taken out of the ground for the sheep, may be given them in other places. Thus, if the farmer wishes to have the advantage of a fold upon barren land, he may feed with these turneps; and the dung and urine of the sheep will enrich the ground on which they are folded, though the food be brought from elsewhere.

On land intended to be sown with barley, let the sheep be brought on late, that the advantage of their dung and urine may be strong in the ground, at the time when it is wanted for the seed; and let the ground be plowed but lightly, because the rains will in that case wash the manure to the roots of the new crop; but if it be buried too deep by a careless method of plowing, nothing can bring it up again, nor can the crop ever have the advantage of it.

There is another root, the culture of which we have recommended, and which may be of excellent service at this time to the farmer, the carrot. This, though usually considered as a garden product, answers as well in the field; and beside the profit arising from the sale, will answer the more immediate purpose of the husbandman, in fattening his cattle: there is no root that answers like it. After October the carrot gets no good in the ground, therefore it should be taken up this month, partly that the land may be no longer occupied by a crop, to which it can give no farther assistance; and partly, because the frost will make it difficult afterwards to get them out of the ground.

They should be sorted when they are taken up; the finest and best looking should be sent to market, where they will fetch a good price; and the others kept for feeding of oxen and cows that are fattening. There is no food whatsoever that answers this purpose so well; and it may be done by this in a third part of the usual time.

Horses will eat them also, and they will take the same effect. It is a jockey's trick which they chuse to keep to themselves, for the ready getting a horse into good case for sale.

This week sow and plant the seeds of trees. The acorn never succeeds so well, as when sown early in November. This fruit, like others which have a great deal of the fleshy substance, decays when long kept. It is the reason



reason tea-seeds never grow when sent over to England; and the farmer should know as well as the gardener, that these kind of seeds will not strike, unless sown soon after they are fully ripe and hardened.

Sow beech-mast also this month, and chestnuts; but for these last trees chuse the Spanish kind. There is so much oil in these seeds, that they keep good some time longer than others of that size; and if chosen when they come fresh over from those warmer parts of Europe, they seldom fail.

Fill up now all deficiencies in hedges, coppices, and timber plantations.

Plow and prepare carefully the lands which are to be sown with spring corn and pulse. The higher they are thrown up in ridges, and the more they are by that means in all parts exposed to the air, the better they will serve for the supply of nourishment to the crop. Mr. Tull says, this breaking of the mould will answer alone for the enriching of it; but it is proper the farmer should add the usual manures. Though the tillage will not do all, it does a great deal; and the farmer will find it lessen the price of manure.

Turn out hogs now into the woods, commons, and roads where there are beech trees; and according to the produce of the year, let them remain out a longer or shorter time. The beech produces some years such abundance of fruit, that at this season of the fall of them, hogs will take care of themselves abroad better than can be done at home, and will be better fattened, and sweeter than any other way: it is the creatures principal natural food, and we find it agree with them accordingly.

The acorn is a proper mixture with the beech-mast in this creatures food; and they get one naturally with the other. Farmers see this; and where there are no beech trees, they beat the oaks, and get down acorns in abundance, to which they turn in the swine. These the greedy creatures eat too ravenously, and fall into disorders. The acorn is too astringent for their food alone, but with the beech-mast it agrees well with them. Where acorns are eaten unripe by the hogs, they do yet more mischief: this is the cause of several of their diseases, but the farmer is to blame himself for it; for there is no way of the hogs getting at unripe acorns, but by his giving them the opportunity. They do not fall from the tree till they are whole some, because they hang till thorough ripe, and they then slip out of the cup: on the contrary, the farmer beats them down green, and gives cup and all together.

The husbandman should now attend to the kind of sheep he buys in: for there are small differences which yet occasion a great deal of alteration in the profit.

The sheep without horns, which are fed in several of our inland counties, are an excellent kind. They fatten easily; and there is no kind brings a better price. They require more attendance than others, because they are more vigorous and mischievous in breaking fences than any; and for the same reason, they are subject to cast their lambs; miscarriages arising from violent straining. Where they are well attended, nothing of this will happen; and otherwise they are extremely profitable.

Continue reducing the pasture grounds to order, by cutting away all irregularities, and drawing up perennial weeds by the roots.

Where the molehills and anthills are but few and small, a labourer with a spade may very well perform the business; but when they are large, and there are more of them, the plow contrived for this purpose is preferable.

THE

HUSBANDMAN'S KALENDAR.

MONTH THE TWELFTH.

DECEMBER.

THE wheat crop is the first that the farmer is to consider in every month; but in this there is little to be done about it.

Sowing is wrong: for if from any accident he has been prevented from putting in his seed at a better time as the last, or the two preceding months, which are much better, he

will do wisely now to defer it a month longer. He cannot expect much good in so hard a season; and there is the greatest danger from severe frosts falling upon the young growth. Wheat sown in January will be very nearly as forward as what should be sown in December; and there will be less danger of its falling by frosts in the first period of its growth.

Where the wheat sown in better time is now up, let the farmer, according to its appearance, and the condition of the land, assist and improve it by a top dressing of dung. This is better than the lighter kinds, as scot and pigeons dung, and the like, at the present season; and they are, in the same manner, fittest in spring. The purpose is now to strengthen the ground, and in some measure to shelter the crop: it will then be the point to enliven it for a sudden shoot; dung, which at once warms and covers excellently, answers the present purpose; and those light dressings, which are washed in as soon as laid on, do the other.

The farmer who has his ground ready now, though his prudence prevents his sowing the wheat till next month, will do it vast service by another good plowing. This is a season when frosts of the severest kind may be expected, and snow with them; these break and mellow the ground, and the more the soil which is to feed the ensuing crop is exposed to them, the more it will receive the advantage. The oftener it is broke and turned up with a new surface; the more is the benefit.

Though it be a general rule, that wheat should not be sown in December, yet does it not exclude all possible exceptions. There are lands so warm, that frost takes little effect upon them, in comparison of what is seen in the generality of others. These will subject the crop to less danger than the others from a December sowing: therefore it may be more allowable, though we can scarce say that this practice can be advisable in any instance. If the farmer has such ground where turneps are just eaten off, he may with less hazard venture in his wheat; but it is better to let alone till the next in any other case.

In new sown wheat fields, during open weather, there is great danger of the crop being devoured by rooks. They find less food of other kinds at this than any other season; and therefore they will venture hard for the new sown wheat. Many remedies have been proposed, but there is none like a gun. The shooting a few of these cunning creatures discourages the rest; and they will be content with worse food, where they can eat it with more safety.

Where it happens that the ground is in order, and a crop of the pulse kind wanting, the grey pea, called the *horn grey*, may be sown this month; it is hardy, and will make its way through the unfavourable circumstances that attend such a plowing.

Plow up the land intended for sowing with oats: it will answer vastly better than if omitted to a later time; and the increase of the crop will many times return the advance upon the charge of labour: this we frequently inculcate; and the farmer should carefully attend to it. In other roads of life, profit often rises principally from the savings: but with him, if he know his business, there is nothing so well returned, as a small advance of labour.

The land that has been covered with a turnep crop, and sown down without pecking out the roots, will now lie in an excellent condition. The sheep eat the turneps as they stand, by scooping every large root into a kind of basin. In the mean time, their dung and urine will have greatly enriched the ground; and these hollowed roots will detain any wet that falls into them, and will rot with it. Their whole substance will, in that manner, be transformed into a kind of manure, and by degrees mixed with the ground. Thus will the whole land be very thoroughly enriched; and when it comes to be lightly plowed up together, will receive the seed of the succeeding crop, with all the needful principles of vegetation.

The frosts are often so severe at this time, that the sheep or other cattle cannot get at the turneps intended for their food. Many a farmer has found great mischief from this in hard winters; but it is his own neglect of doing things in proper time. That is the cause. He should expect that strong frosts will harden the ground at this season, and prepare accordingly, by taking up a sufficient quantity of these and other roots in time.

We have observed, that the turneps will keep when they are out of the ground; and beside the method by burying them in dry earth, where they will not grow, they may be kept in barns, or elsewhere, under shelter, at this season, and the frost will not injure them. This is a very necessary precaution; and if it has been omitted by the farmer hitherto, he should now, during the first opportunity of open weather, take care to do it. They must not be piled



up in too large or compact heaps, for fear of heating; nor must they lie too open to the air, for their watery juice soon freezes, and they may be so rendered as useless, as if they had lain in the ground.

This care being taken of the ground, and of the standing crops, and the severity of the weather probably not admitting any thing more to be done out of doors, let the careful farmer get his hands to work at thrashing and cleaning his corn, pulse, and other seed for market. They have had time enough now, since the bringing them off the ground, to get into perfectly good order; and let him see that his labourers do their business. It is in their power, by a careful management, to advance the price of the corn; or by their slovenly way of getting it up, to reduce it: nor will any thing prevent great loss, as well as discredit in this work, but the eye of the master.

No crop of corn is so clean, that there will not, in a large quantity, be some seeds of weeds; nor is it usual to escape altogether the common disorders of smut, and the like. If the seeds of weeds, or the smutted grains of corn be left among the rest, they will reduce the price; and no care is too much to get them out.

A great requisite to the cleaning, and indeed to the well thrashing of corn, is sufficient barn-room, a good, large, even and hard floor, of due extent in breadth, but chiefly in length, will make the thrasher's work go on more pleasantly, and it will be performed in every respect better. There is more scope and freedom for the use of the flail in all movements and directions; and when the business of throwing comes, there are few of the seeds which debase the corn, that will fly to the end of the cast, that a strong man can give the wheat. Weight is the requisite for flying far at this cast; and the wheat is so much heavier than the seeds of any of any of these weeds, that it will make its way to the end, leaving them at different distances along the floor.

After the throwing has been thus well performed, the perfect cleaning of the wheat by the sieve is very easy: this separates such parts as are composed of good wheat, with some of the husk, or other foulness among it; and these naturally get to the top in sifting; and may easily be taken out. They are not to be thrown away like the seeds of weeds; and the like light matters which had been separated in throwing; but are to be saved; and when there is a quantity of them, they are to be thrashed again, and by that means cleared.

There are many other ways of cleaning wheat, which the farmer may use according to the various circumstances of things; and among these the principal is by the fan. This is an excellent and very cleanly method. Weight is the great character of wheat, as we have observed before; and no light substance will be left among it, after the use of this instrument.

In the thrashing of barley, for which this month is a very proper season, all the necessary precautions for wheat should be used, and even more; for there is no corn that is so difficultly got out of the ear.

A sound oak floor is a great advantage for this business; and there must be barn-room. Two thrashers will perform the business much better than one; and the farmer will be always in the right to allow this, for it is so much real gain to him.

When this corn is thrashed, it should be sifted before the throwing. The sieve must have large holes, and all that is meant by this article is the separating the beards and pieces of the straw, which have been mixed with it in the thrashing.

After this it is to be thrown from one end of a long floor to the other; and the seeds of weeds, and all other light matters that had been mixed among it, will by that means be separated.

When it is all thrown, let the corn be examined; and if the seeds of weeds have not been perfectly separated by this, it must be thrown again: this second work will separate what the first did not; and the barley will then be ready for the skreen, by which it will be finished for the market. It is a good caution to riddle or sift it again before the skreening, for this is apt to be the foulest of all grain: the extraordinary labour of all these operations is but a small addition of charge to the owner, and he will find a great deal of profit, as well as credit, from the seeing it taken, and consequently carrying his corn clean to market.

The fan which we have mentioned for the cleaning of wheat, and the several other methods, may all be applied to barley with advantage: but nothing frees it so perfectly from all kinds of foulness, as the method just named.

The cleaning of oats may be done solely by the fan; and this, in many places, is all that is expected; no better method being thought of, nor cleaner oats brought to market, than such as are prepared thus. Immediately after thrashing, the oats are drawn up into a heap, and the long straws and other gross foulnesses are got out; they are then brought to the wind, and fanned once, twice, or by some very careful persons three times, and thus finished for the market.

The better method is this: when the oats are thrashed, draw them into a heap; get out the long straws, and then perform the first approach toward cleaning them, by passing them through a sieve with very large holes.

The oats are thus freed from the longest straws, and the worst of their other foulness.

After this fan the whole quantity with a knee fan; and then riddle it through a finer sieve than the first. The purest oats go through, and the foul part will get to the top of the parcel in the sieve: this is to be separated and laid by itself; though it is not in the condition of the clean oats, it is not to be treated as refuse or rubbish. If the oats are not thus made sufficiently clean, they must be passed again through the sieve; and by this last riddling, they are brought into a clean and creditable condition for the market.

The cleaning of the pulse kinds is to be performed the same way; and the farmer has his choice, according to the occasion, and the use he designs to make of them to do it at once by the riddle and fan; or to give them the advantage of throwing.

Pease are in a particular manner calculated for cleaning by throwing; because they are sufficiently heavy to carry themselves a great way forward, and their round shape makes them fly easily through the air. The foulness that is mixed among them is also naturally such, as will most easily be separated in the throwing, because it is broad and light.

As soon as they are thrashed, let them be drawn up into a heap, and the straw and other large stuff that was among them separated; then let them be thrown boldly upon a long floor, after this one sifting, generally cleans them perfectly. If it does not, they should be sifted again.

Where the farmer has sown beans and pease together, which, as we have observed, is often a good practice, this makes no difficulty in the present article of cleaning. The beans and pease may be thrown together, and that will separate the chaff, and other refuse, and afterwards the two kinds may be separated only by a sieve, with the holes of a proper size to let the pease through, and stop the leaves. Thus each may be put up alone for market. This care being taken of the crops for the succeeding year, and the produce of the last, let the careful farmer go over his grounds, and close the circle of the year, by seeing that every thing remains in that good order wherein he has by our direction, or his own knowledge of his business, put it.

If his fences want repair, he will now see it easily, for neither leaves nor weeds will hide the gap: let him take order for the due repairing of them.

Let him examine his plantations of trees. We have directed, in the preceding volumes, in what manner he is to prepare for their security, by tying them up to stakes. Let him see that these keep firm; for if they rock with the winds, the trees will rock with them, and an opening will be made at the bottom of the stem, which will let in the frost, and destroy the roots.

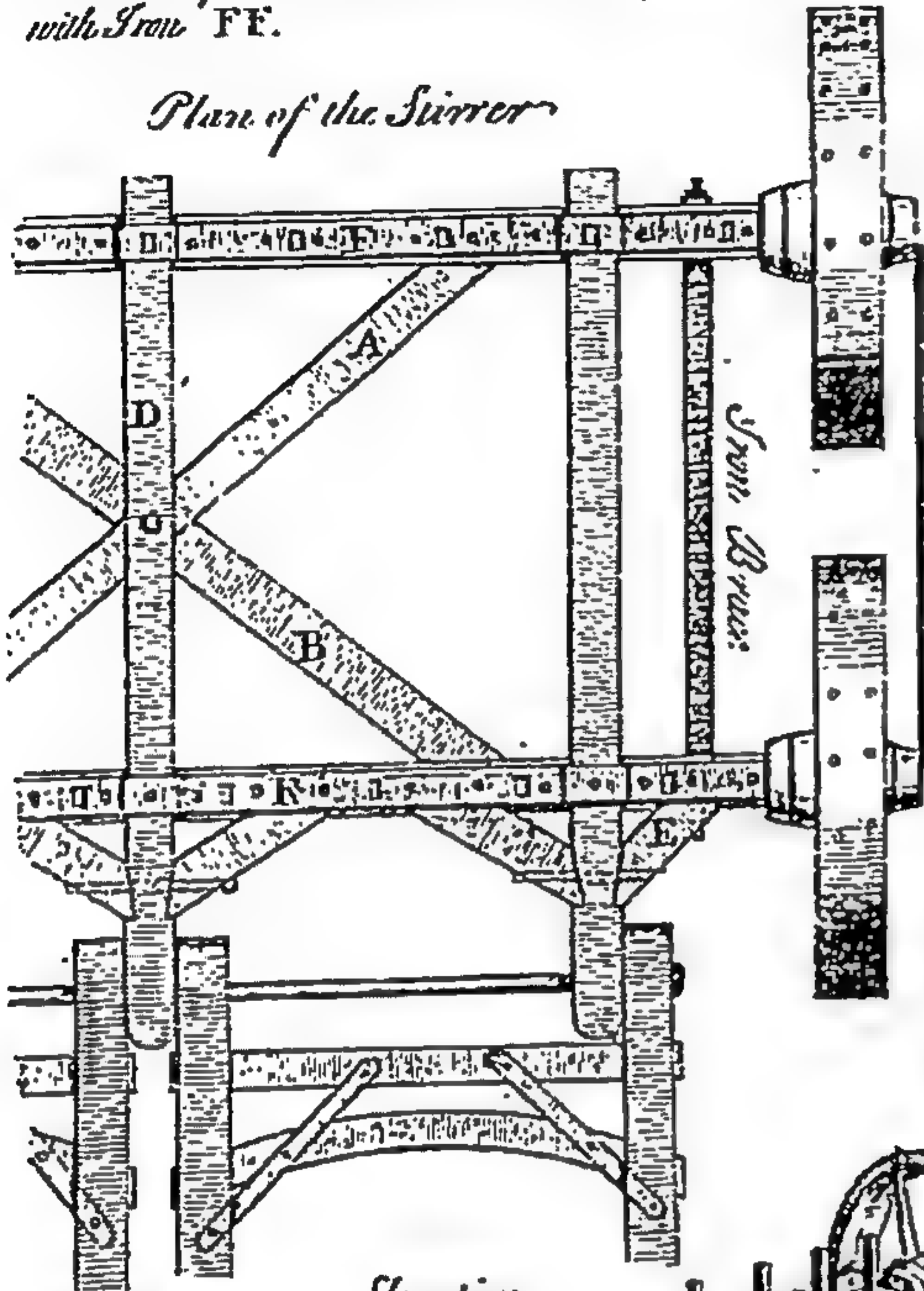
Let him look to his coppice wood that is new planted, or has been lately felled. The successful growth depends upon the young shoots security; and if cattle can get in, they will do vast mischief, by gnawing the tender buds. They love them at all times, but most when there is least fresh foods of other kinds.

Every thing being thus put, and kept in order, let him devote the few days at the end of this month, which the church has appointed as a most solemn festival, to the intended service: let him thank God for the success of his last year; and pray for a blessing on the succeeding. Let his doors be open to his inferiors, that they may say the blessings which providence has bestowed are not thrown away upon him: and let him, by a devout hospitality, obtain the good word, and good will of those who are to serve him in his next year's business.



The Tops of the Axletrees are Strengthened with Iron FF.

Plan of the Surrer



Iron Braces

Profiles

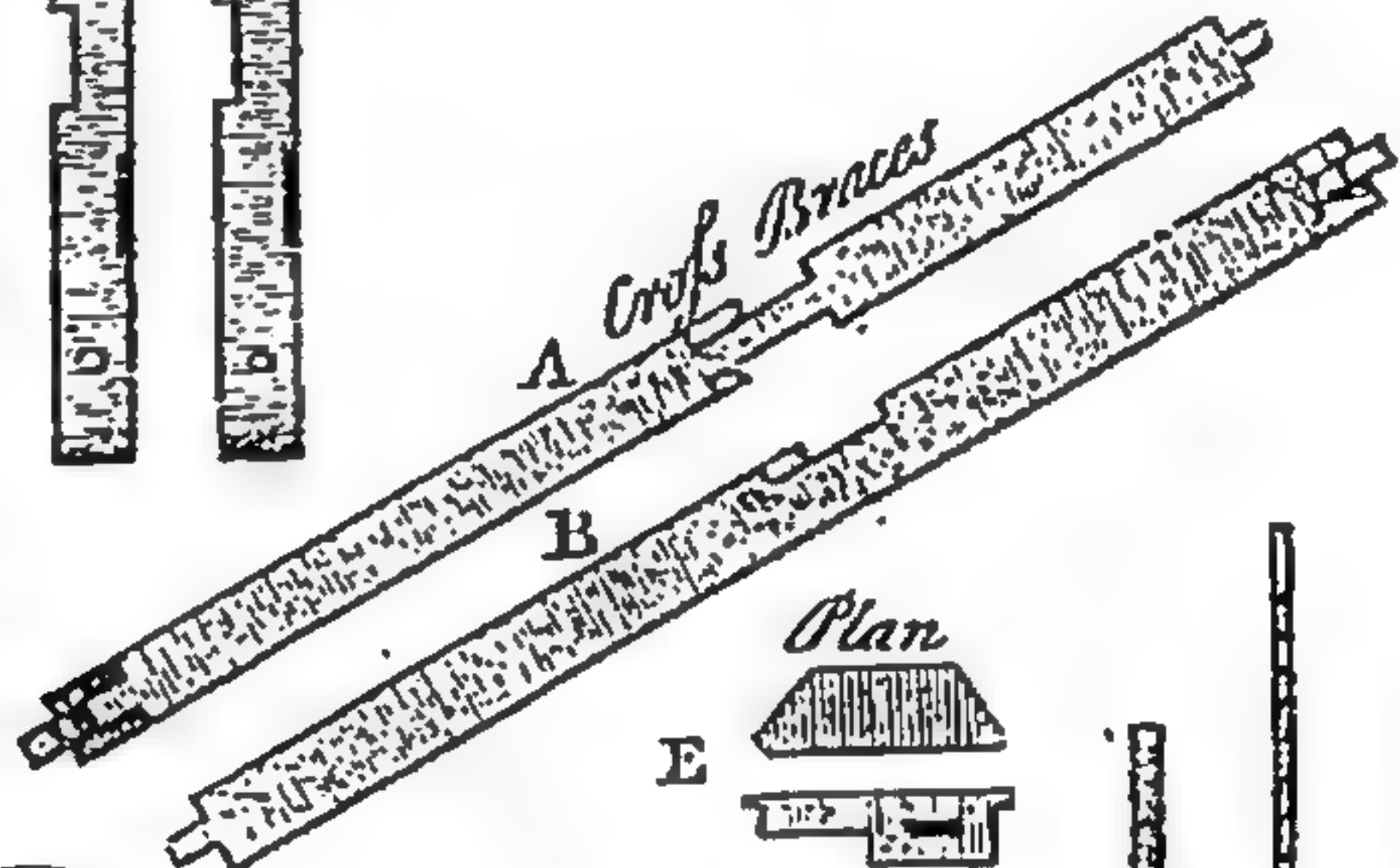
Slinder Axletree



Fore Axletree



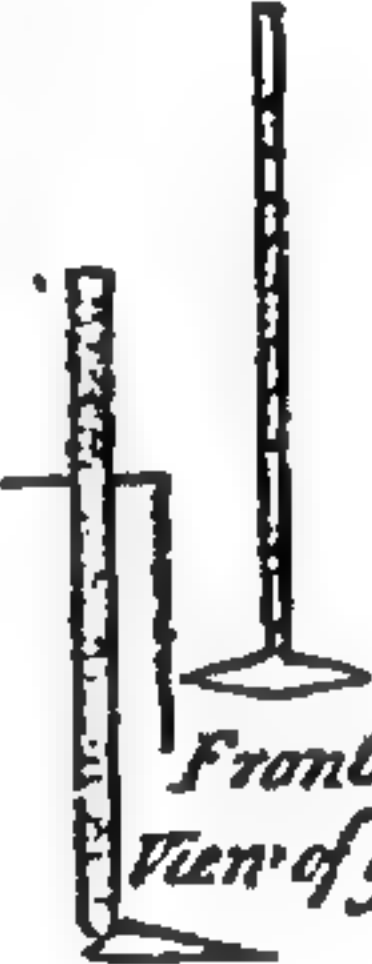
A Cross Braces



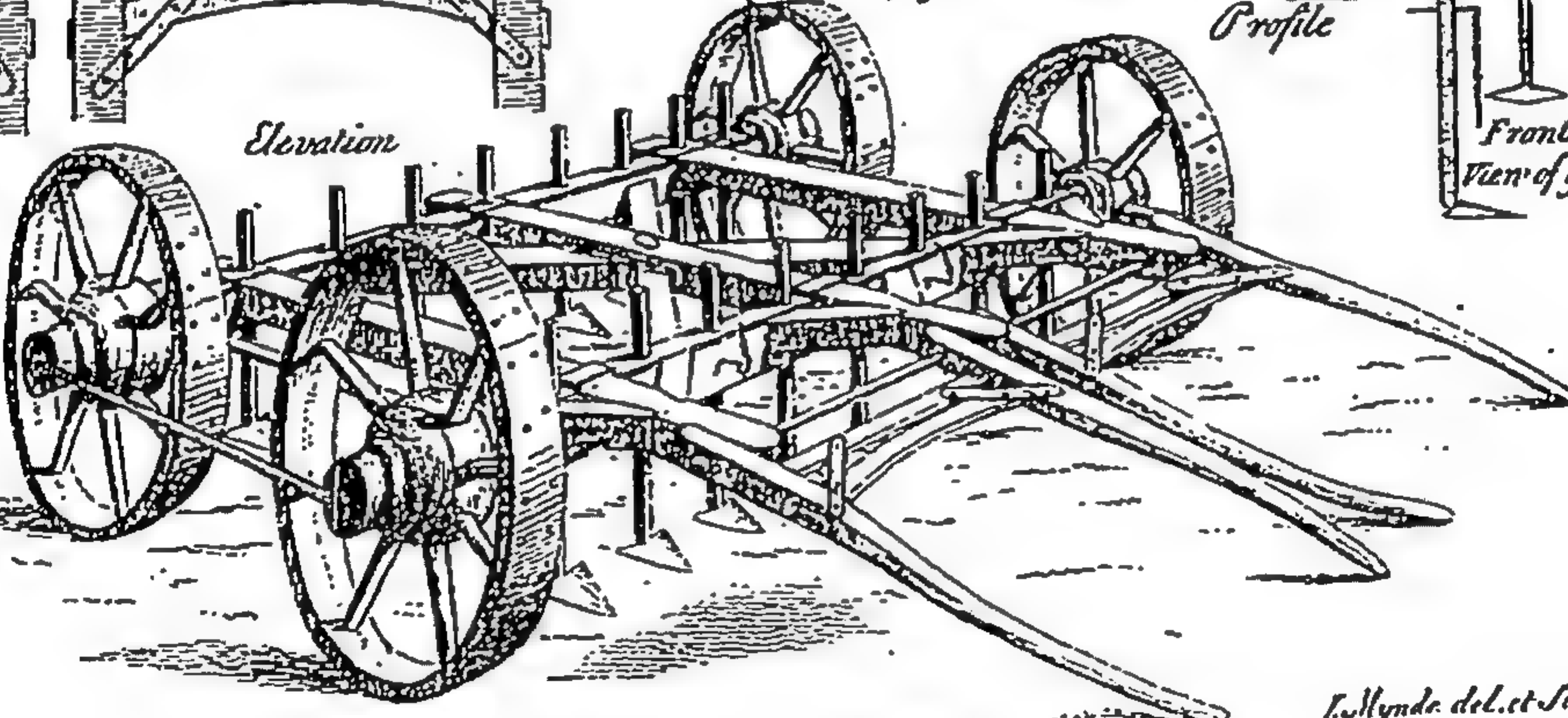
Plan

E

Profile



Elevation



A. Scale of feet for y. Plan & Profiles



J. Mynde del. et Sc.





# A P P E N D I X.

## *A Description of the New Invented Instrument for cultivating of Lands, called, THE STIRFER.*

**T**HIS Instrument contains two Parallel Beams, or Axes, supported by four Wheels, wherein two Rows of Shares or Hoes are placed so, that the hinder Row cuts the Ground between the Interstices of the fore Row, consequently no Part of the Ground remains unmoved. Its great Use is in stirring the Fallows, after they have been twice ploughed in the common Way, and rolled (if necessary) and will stir twelve Acres, or more, a day. 'Tis also useful in clearing Weeds out of Wheat and Bean-Stubble, by raising up the Shares or Hoes to any Height required, which will greatly forward a Season.



*The Proprietors of the Compleat Body of Husbandry, esteem it a Duty equally to the Public and themselves, to insert the following, received from the Country.*

Ordered,

**T**HAT the Churchwardens and Overseers, do forthwith apply to Mr. OSBORNE of Gray's Inn, for the

## Compleat Body of H U S B A N D R Y,

Published by the KING's Authority.

To be bound in rough Leather, and clasped; and that the same be chained in the Vestry-Room, for the Public Use of the Parishioners, to be consulted by them on all Occasions, in that Place, and not elsewhere: And that the Name of the Parish be set on the Book, to prevent its being stolen; and to deliver the same as soon as he can, to Mr. WILLIAM MASTERMAN, of Lincoln's-Inn, London, who is desired to pay for it, and send it hither if possible before Easter.

By the Vestry.

Lanteglos, juxta Camelford,  
Cornwall, March 6. 1757.

S I R,

**W**E desire you to execute the above Order; and we wish our Example may be followed by every Parish in the Kingdom, who are

*Your Humble Servants,*

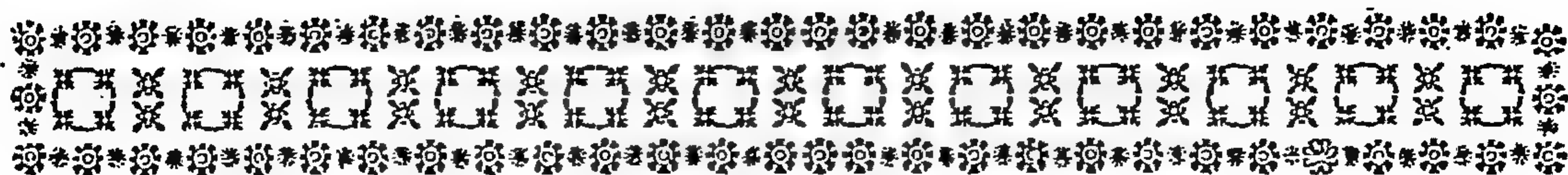
John Barnes, } Churchwardens.  
John Seccombe, }  
Jonathan Rundell, } Overseers.  
Joseph Tingcombe, }

N. B. If publishing this Order, will be of Use, you are at Liberty to do it.

This Book is Printed for, and Sold by T. OSBORNE, in Gray's-Inn, S. CROWDER, and Co. on London-Bridge, and by all the Bookellers in Great-Britain and Ireland.

Note, Any Nobleman, or Gentleman, desirous to make a Present of this Book of Agriculture and Farming to his Parish, may, by applying to any one of the Proprietors afore-mentioned, be supplied with it in the Manner the above Parish require theirs to be done.





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## Compleat Body of HUSBANDRY.



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